How Do Parents Affect Preschoolers' Self-Regulation? Establishing the Role of Autonomy Supportive Parenting

A Dissertation
SUBMITTED TO THE FACULTY OF
THE UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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June 2017

Acknowledgements

I would like to thank the following people for their help and support throughout my graduate career and during this research. First, I thank my adviser, Dr. Stephanie Carlson, who has always supported me in following my own path to become a researcher. I truly appreciate the guidance that allowed me to become part of the world of academic research. I thank my committee members: Dr. Philip Zelazo, Dr. Glenn Roisman, and Dr. Jeffrey Simpson, for their insight and support of this project.

I am incredibly grateful for my dedicated research assistants: Maria Bertrand, Olivia Christopher, Malaz Ebrahim, Elsa Mattson, Heather Markun-Heard, and Bingle Torres Gavarrete. The amount of coding done for this project was immense, and I could never have done it alone. And I so appreciate the evenings and weekends given up to run participants. Thank you to my cohort- and lab-mates for the smiles and relationships, and especially to Rebecca Distefano for her support on this project.

I thank the families and children for their time and energy, because playing games with 3-year-olds was by far my favorite part of graduate school.

Thank you to my dad for teaching me to think like a scientist, and to my mom for instilling in me a passion for children and families. Thank you to my sisters for doing this Ph.D. life with me and still staying connected when flung to the far winds. And a huge thank you to my husband, Josh, for loving me every day of these past 5 years and always believing that I could soar.

This research was supported by a University of Minnesota Doctoral Dissertation Fellowship and an Institute of Child Development small grant.

Dedication

To Joshua, the man I have chosen to parent with in the future.

Because dads matter.

And to my parents, my first teachers.

Because autonomy support isn't just for preschoolers.

Abstract

The development of skills needed to regulate one's own behavior are increasingly recognized as crucial for children's successful development, and promoting these skills in early childhood has become a high priority. Parents are thought to be a primary influence on the formation of these skills. This study was an experimental investigation of the parenting behavior known as autonomy support and its effect on children's self-regulation. We observed parents (half mothers, half fathers) interacting with their 3-year-old children (*N* pairs = 128). Parent and child typical behavior was measured at baseline. Then, in the manipulation phase, parents were randomly assigned to receive instructions to interact with their child in either a high autonomy supportive or highly controlling way. Child behavior was again measured at post-test. Results showed that mothers and fathers had similar parenting quality at baseline and there were few differences in their effect on child self-regulation. In the manipulation phase, parents in both conditions were able to change their behavior based on the instructions given. Changes in parenting affected child behavior during the manipulation puzzle, although it did not affect child post-test behavior. These results indicate that parent autonomy support is a promising target for interventions focused on improving child self-regulation skills.

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Chapter 1. Introduction

Parents can be seen as children's first and most important teachers. One crucial thing parents teach children in the preschool years is the skills needed for self-regulatory behavior. The relation between parenting quality and child self-regulation has been a rapidly growing area of research in recent years. Regulatory skills, including executive function (EF), are increasingly recognized as key for children's successful development, and therefore promoting these skills in early childhood has become a high priority. There is robust correlational evidence that quality of mother parenting in the preschool years is linked to child self-regulation development. However, there is a paucity of studies that allow causal claims to be made about the link between parenting and child self-regulation. We also know much less about the role father parenting plays in preschool self-regulation. The purpose of this study was to begin to understand if there is a causal influence of autonomy supportive parenting from both mothers and fathers within a short-term experimental context.

Executive Function and Self-Regulation: Definition and Importance

Executive function (EF) refers to a set of higher-level neurocognitive skills that allows people to control their own thoughts and actions and to direct behavior toward long-term goals (Carlson, Zelazo, & Faja, 2013; Hendry, Jones, & Charman, 2016). EF involves the ability to effectively integrate bottom-up (reactive, automatic) and top-down (reflective, effortful) processes (Zelazo, 2015) to achieve a desired outcome. Studies with preschool children have supported a two-factor explanation of EF, reflecting Hot EF (activated in highly motivating and emotional contexts) and Cool EF (activated in contexts without strong emotional demands) (Carlson, White, & Davis-Unger, 2014;

Kim, Nordling, Yoon, Boldt, & Kochanska, 2013). Self-regulation is a broader concept that refers to behavior in complex real-life situations, such as planning ahead, persevering through frustration, and using multiple strategies, that relies on a foundation of executive function (Blair, 2016). Self-regulated behavior is the product of both the child's "skill" (e.g., EF abilities) and "will" (e.g., choice and motivation to display abilities in a particular context; Neitzel & Stright, 2003; Schunk, 1995). In the current study, executive function will refer to specifically measured neurocognitive skills, while self-regulation will refer to the directly observable behaviors thought to reflect the implementation of those skills.

The development of executive function is a process that lasts from birth into adulthood as the prefrontal cortex matures, with a period of rapid development from three to five years of age (Baptista et al., 2017). Behavior genetics studies have shown that while EF is heritable (Friedman et al., 2008), developmental change in EF is influenced by shared and non-shared environments as well as genes, and that individual differences between children are primarily due environmental influences (Fujisawa, Todo, & Ando, 2016). Prefrontal cortex development is influenced by the environment (Schneider-Hassloff et al., 2016), and its protracted development may indicate an extended period of sensitivity to social influences, such as parenting, compared to more rapidly developing skills (Baptista et al., 2017; Hackman & Farah, 2009; Hughes & Ensor, 2009). Indeed, variations in parenting quality have been specifically linked with differences in the functionality of children's EF-related neural circuits (Hane & Fox, 2006; Schneider-Hassloff et al., 2016). The rapid development of EF in the preschool years suggests this may be a time period when environmental experience is especially important, and interventions may be most effective in this period of plasticity (Zelazo & Carlson, 2012).

Self-regulation is recognized as a key developmental task in the preschool years (Calkins, Smith, Gill, & Johnson, 1998; Flavell, 1977), and at this age has a foundational role in competent behavior in both cognitive and social domains. A substantial body of research has shown that EF skills are linked to academic outcomes, including math and reading (e.g., Blair & Razza, 2007; Willoughby, Magnus, Vernon-Feagans, Blair, & the Family Life Project Investigators, 2016), and successful functioning in a classroom environment (Baptista, Osorio, Martins, Verissimo, & Martins, 2016; Nesbitt, Farran, & Fuhs, 2015) Teachers have identified self-regulation skills as even more important than basic academic knowledge for children entering kindergarten (McClelland et al., 2007), and children with higher EF are able to learn more from a given amount of instruction (Benson, Sabbagh, Carlson, & Zelazo, 2013). Outcomes associated with high self-regulation also persist across the lifespan, including educational attainment, income, social skills, mental and physical health, and criminal offenses (Mischel et al., 2011; Moffitt et al., 2011). Developing good self-regulation skills in childhood is a crucial step toward long-term success, and it is therefore important to fully understand its antecedents.

Parent Influences on Executive Function

Theoretical background. Self-regulation is influenced by a variety of factors at multiple levels of analysis, from biological to social (Blair & Diamond, 2008), with parenting recognized as a foundational environment for self-regulation development (Deater-Deckard, 2014; Fay-Stammbach, Hawes, & Meredith, 2014; Hendry et al., 2016;

Moriguchi, 2014). Parents are main players in important early social interactions, and EF is transferred from parent to child through correlated and interacting genetic and environmental processes (Chang, Shaw, Dishion, Gardner, & Wilson, 2015; Deater-Deckard, 2014). The quality of a parent-child interaction is determined by multiple factors, such as the child's current cognitive ability, parent perception of the child, parent's knowledge and task competence, and parent and child attitudes toward the problem (Neitzel & Stright, 2003). Vygotsky's sociocultural theory and self-determination theory both proposed mechanisms for the relation between parenting and self-regulation.

Vygotsky's sociocultural theory. Vygotsky proposed that children learn the skills required for self-regulated behavior through their interactions with adults. When children internalize, transform, and reorganize the problem solving skills they use during interactions, they are gradually able to take control of their own cognitive and emotional processes (Vygotsky, 1978). Children form concepts about higher level processes such as problem solving through the explanations they are given by adults (Landry, Miller-Loncar, Smith, & Swank, 2002). Vygotsky saw the caregiver's main role in dyadic activity as providing assistance at an appropriate level, slightly ahead of the child's competence, so a child can progress toward independence (Moss, Parent, Gosselin, & Durmont, 1993). Wood (1980) named this process "scaffolding," where the adult's help should vary in response to the child's ability level. The adult can connect the low-level contributions the child is able to make to the larger framework of the task, and as the child masters components, the adult can transfer the responsibility for those skills to the child. When parent behavior is contingent on the child's current ability, this results in higher levels of child success than a consistent level of help (Wood, 1980). One part of the gradual releasing of parental control noted from toddlerhood into preschool is a shift from direct physical intervention to using more complex speech to guide the child, giving the child more responsibility for the actual completion of the task (Landry et al., 2002).

Self-determination theory. The main hypothesis of self-determination theory is that people achieve self-motivated success when three basic needs are met by the social environment: autonomy, competence, and relatedness (Deci & Ryan, 2000; Grolnick & Farkas, 2002). The need for autonomy (the ability to choose and organize one's own experiences) is most associated with self-regulation (Deci & Ryan, 2000), and a focus on autonomy supportive parenting (a concept with many parallels to the Vygotskian idea of scaffolding) is a key feature of SDT theory (Grolnick & Farkas, 2002). Self-determination researchers define autonomy support as encouraging children to be self-initiating and independent in problem solving, and giving children choice and participation in decisions rather than using pressure and rewards to motivate behavior (Grolnick & Ryan, 1989; Joussemet, Landry, & Koestner, 2008). To assist children in developing self-regulation, parents expose children to adaptive strategies through modeling, guidance, and opportunities for practice, which the children can then internalize (Grolnick & Farkas 2002).

Autonomy support. For the current study, autonomy support is defined as helping a child just enough so the child is able to use his/her own skills toward successful completion of a task. Autonomy supportive parenting requires the parent to take the child's perspective, respect the child's pace, and ensure the child is playing an active role. Behaviors such as providing choices, constraining the problem space so the child is more likely to succeed, and guiding the child to correct their own mistakes are considered autonomy supportive. Autonomy support can be seen as a balance between providing both help and independence. Autonomy support must be tailored to each child's individual abilities and contingent on their current understanding of the task (Wood, 1980).

Autonomy support is expected to be beneficial for child self-regulation for a number of reasons. Autonomy supportive parents provide alternative perspectives, redirection toward more appropriate goals, and an external dialog that can all be internalized by the child (Moriguchi, 2014). When children have high levels of responsibility, they get more practice with important skills such as planning, making decisions, monitoring errors, and reflecting on the goal of the task. Thus, they have more opportunity to use their cognitive skills to their highest ability. Autonomy supportive parenting gives children more experience with successful problem solving experiences and therefore leads to greater motivation and feelings that the goals are enjoyable and important (Bindman, Pomerantz, & Roisman, 2015). Additionally, interacting with a responsive, invested parent may increase a child's feeling of emotional safety and therefore allow them to direct their resources to the task rather than to relationship concerns (De Ruiter & van Ijzendoorn, 1993). Autonomy supportive parenting influences multiple systems of the child, spanning cognition, motivation, and emotion.

Parents can be non-autonomy supportive in two ways: by either being controlling or laissez-faire. Controlling parenting occurs when parents provide too much help. They may overly direct and make decisions, do parts of the task the child could do, or rush the child's thinking (Whipple, Bernier, & Mageau, 2011). Controlling parenting is thought to undermine internal motivation (Grolnick & Farkas, 2002). There are some indications that the commission of controlling behaviors may be even more detrimental to EF skills than the omission of positive autonomy supportive behaviors (Karreman, van Tuijl, van Aken, & Dokovic, 2006; Merz et al., 2015; Meuwissen & Carlson, 2015), as controlling behaviors take the active role out of the child's hands, denying them the opportunity to act on their environment and regulate their own behavior.

On the other hand, laissez faire parenting occurs when parents give too much independence. They may allow their child to struggle, give little useful input or guidance, or are uninvolved with the task (Whipple et al., 2011). Laissez faire parenting may be detrimental because children may not be able to learn the process of the task without proper guidance, and they may feel more frustrated than children who are receiving more help. Laissez-faire parenting has not typically been observed in research, however, self-reports of permissive parenting (low on emotional involvement and structure) have been related to behavior problems in preschool children (Casas, Weigel, Crick, Ostrov & Woods, 2006; Querido, Warner, & Eyberg, 2002).

The link between mother autonomy support and child self-regulation. Research has identified various mothering characteristics that may facilitate the internalization of regulation. In infancy, responsiveness and attachment security are crucial for nascent cognitive abilities. However, by the preschool period, supporting a child's developing autonomy and providing appropriate cognitive stimulation appear to be the most important for child self-regulation development (Russell, Lee, Spieker, & Oxford, 2016; Wilson & Durbin, 2013). A meta-analysis of 41 studies on parenting and self-regulation found that both positive control (e.g., teaching, guiding – autonomy supportive behaviors) and negative control (e.g., intrusiveness, power-assertion – controlling behaviors) were significantly associated with child self-regulation, with small effect sizes (Karreman et al., 2006). Autonomy support is the aspect of parenting most consistently predictive of child EF (Bernier, Carlson, & Whipple, 2010; Fay-Stammbach et al., 2014; Karreman et al., 2006), even when covarying other aspects of parenting such as warmth and cognitive stimulation (Bernier et al., 2010; Bindman et al., 2015).

In preschool children, high levels of observed maternal autonomy support are related to greater task competence after a dyadic interaction (Freund, 1990; Gauvain & Rogoff, 1989); better emotion regulation (Calkins et al., 1998; Grolnick, Kurowski, McMenamy, Rivkin, & Bridges, 1998); and higher performance on EF tasks (Bernier et al., 2010; Lengua, Honorado, & Bush, 2007; Merz et al., 2015; Razza & Raymond, 2013). Child language has mediated the relation between parenting and later child EF in multiple studies (Hammond, Muller, Carpendale, Bibok, & Liebermann-Finestone, 2012; Landry et al., 2002; Matte-Gagne & Bernier, 2011). There is evidence that early autonomy supportive parenting extends across contexts to predict later academic achievement (even into high school) through its effect on child EF and self-regulation, even when controlling for child IQ, temperament, and other aspects of parenting (Bindman et al., 2015; Devine, Bignardi, & Hughes, 2016; Neitzel & Stright, 2003; Russell et al., 2016). The links between child self-regulation and maternal autonomy support have been corroborated by multiple high-quality, longitudinal studies, including large-sample studies. This research has been done in diverse populations including various risk factors. Therefore, there is strong evidence of a non-trivial relation between maternal autonomy support and child self-regulation.

Father influences on child self-regulation. The vast majority of research on parenting and child self-regulation has focused on mothers. There is a striking gap in our knowledge about the effect fathers have on children's self-regulation. Fathers are now more involved with their young children's care than in the past, which is redefining the roles of both fathers and mothers as parents (Baptista et al., 2017; Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000). Fathers need to be included in child development research to fully understand the context of development (Cowan, 1997; Cox & Paley, 2003; Lamb & Lewis, 2010). Some consistent differences are found between father and mother parenting, with fathers having lower involvement, tending to be more playmates than caregivers, and engaging in more physical and unpredictable play (Fletcher, St. George, & Freeman, 2013; Grossmann, Grossman, Kindler, & Zimmerman, 2008; Lamb, 2004). However, fathers can be expected to meaningfully vary on qualities such as autonomy support, as mothers do, and these variations may have corresponding implications for child development. Shannon and colleagues (2002) argue that variations in fathers need to be emphasized rather than only looking at mean differences between mothers and fathers, which can lead to stereotyped views of fathers as only engaging in rough and tumble play.

Empirical studies have shown that father parenting is important for child cognitive development (e.g., Bronte-Tinkew, Carrano, Horowitz, & Kinukawa, 2008; Magill-Evans, Harrison, Rempel, & Slater, 2006; Ryan, Martin, & Brooks-Gunn, 2006), and in many cases remains a significant predictor even when covarying mother parenting (e.g., Amato & Rivera 1999; Coley, Lewin-Bizan, & Carrano, 2011; NICHD Early Childcare Research Network, 2004; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004).

Connor, Knight, and Cross (1997) found that mothers and fathers were equally successful at scaffolding their preschoolers during a literacy task and that higher quality parenting was associated with better child outcomes for both fathers and mothers. A few recent studies on child self-regulation have included fathers. Father self-reported parenting is related to child self-regulation (Lucassen et al., 2015; Roskam, Stievenart, Meunier, & Noel, 2014), and observed responsive play is related to later child EF (Bernier, Carlson, Deschenes, & Matte-Gagne, 2012; Towe-Goodman et al., 2014). Only one study has observed autonomy supportive fathering in relation to self-regulation, and it found that father autonomy support was concurrently related to child EF skills at 3 years old (Meuwissen & Carlson, 2015), as well as predictive of child school readiness at 5 years old (Meuwissen & Carlson, in prep). Therefore, evidence is beginning to form suggesting there is little difference in quality between mother and father parenting, and both parents are important influences on child self-regulatory skills.

However, some studies have found that father effects are not as strong as mother effects. In a review on child emotion regulation, Kiel & Kalomiris (2015) report that infants were more affected by maternal than paternal unresponsiveness, and suggest that father behaviors are absorbed into the general family climate, while maternal behavior has unique effects on children. When measuring both maternal and paternal mental-state talk, Baptista and colleagues (2017) found that only maternal mental-state talk was related to a child EF composite. These studies did not account for the amount of exposure the child had to each parent, which may affect the strength of parenting effects. It is also possible that when parenting dimensions and tasks that were designed for use with mothers are transferred to fathers, they do not reflect the most important aspects of the father-child relationship (Grossman et al., 2002). It is important to conduct more studies directly comparing mother and father parenting to further understand possible differences.

Conclusions about correlational research. The research reviewed to this point has been correlational, measured either concurrently or longitudinally. Because there is no random assignment or manipulation of variables, we cannot rule out the possibility that these results are due to confounding factors. Although many of the studies controlled for some important variables such as parent demographics and general child cognitive abilities, these correlational studies do not address crucial possible causes such as shared genetics or bidirectional effects from child to parent (e.g., children with higher self-regulation may be easier to parent well). Recent research has shown that children's self-regulatory behavior does feed back into the parenting they receive, with low self-regulation eliciting more control from parents (Kiel & Kalomiris, 2015; Merz, Landry, Montroy, & Williams, 2016; Meuwissen & Carlson, in prep; Wilson & Durbin, 2013). To investigate causal influences of parenting on child self-regulation development, researchers need to move beyond correlational studies to studies with randomly assigned groups where quality of parenting is manipulated.

Interventions

Existing parenting – child self-regulation interventions. Intervening with self-regulation in the early preschool years could have a cascading effect promoting a variety of crucial skills such as math and literacy abilities, theory of mind, and emotion regulation (Clark et al., 2013). Research has shown that a variety of interventions can change child EF in preschoolers and young children (Bierman, Nix, Greenberg, Blair, &

Domitrovich, 2008; Diamond & Lee, 2011), suggesting that EF is malleable and sensitive to environmental inputs during this time period (Blair, 2016). Relationships with caregiving adults are a crucial context for early childhood development because parents are the primary socialization influences at this time (Bowlby, 1970; 1973; Chang et al., 2015; Shonkoff & Fisher, 2013). Parenting interventions may be especially useful for promoting child self-regulation because they could encompass many components of effective interventions, such as creating supportive interpersonal learning environments, teaching explicit thinking and regulation strategies, and the introduction of activities specifically targeting EF skills (Diamond & Lee, 2011). Numerous recent studies have suggested that educating parents on how to promote child self-regulation could be one avenue to a large impact, and have identified the need for new research to directly evaluate this claim as a major goal (Blair, 2016; Hendry et al., 2016; Merz et al., 2016; Schneider-Hassloff et al., 2016).

A limited number of randomized control trial studies have examined child EF and self-regulation as outcomes of parenting/caregiver interventions. The Attachment Biobehavioral Catch-Up is a parenting program targeting attachment and responsiveness through education and video feedback, and this program improved Dimensional Change Card Sort performance in preschool-aged foster children (Lewis-Morrarty, Dozier, Bernard, Terracciano, & Moore, 2012). Olds et al. (2004) found that when nurses provided home visits to a mother through pregnancy and the first two years of life (focused on improving health-related and caregiving behaviors), their children had higher EF skills than a control group at age 4. Reid, Webster-Stratton, and Hammond (2007) found that children who experienced both a school intervention as well as had parents in the Incredible Years parenting program (designed to teach positive parenting skills and discipline practices) had better emotion regulation than children who were only in the school intervention. These interventions were targeting wide and varied parenting behaviors and were designed to improve child competence across broad domains. A few more recent interventions have been specifically designed to improve child self-regulation, rather than only including it as one of many outcomes. Merz and colleagues (2016) randomly assigned home child care providers to complete an online course in responsiveness, and found that young preschool children in those daycares showed improved EF compared to the control group. Chang and colleagues (2015) trained parents on proactive parenting (which included a focus on scaffolding) when the child was 2, and found that at 5 years old, children had better self-regulation skills. All of the studies with parents focused on high-risk populations, so little is known about how the results would generalize to a broader population of parents and children. More research is needed to identify specific components of parenting interventions that would be most useful for the express purpose of improving child self-regulation.

Autonomy support interventions. Su and Reeve (2011) performed a meta-analysis investigating the effectiveness of intervention programs designed to teach autonomy support (in any context, not limited to parenting). In an analysis of 19 studies, they found that the overall weighted effect size on autonomy support was .63, indicating that the interventions were generally effective. However, when reviewing the 3 studies that included parents, the overall effect of interventions was not significant, which could be due to the small sample size or to factors such as diverse backgrounds of the parents. As this meta-analysis indicates, few studies have attempted to directly improve autonomy support in parents. The lack of multiple high quality studies precludes any strong conclusions about potential effectiveness of autonomy support interventions with parents or their impact on child outcomes. However, correlational evidence suggests that autonomy support is a prime target for parent interventions designed to promote child EF and self-regulation.

Parenting interventions focused on fathers. There is evidence that interventions can promote high-quality parenting in fathers as well as mothers. Magill-Evans and colleagues (2006) reviewed the literature on interventions with fathers of young children. In seven out of the 12 studies reviewed, there was a difference in father behavior as a result of the intervention, and four of the studies reported a change in child behavior. No father interventions have specifically targeted autonomy support. In general, fathers tend to have lower participation rates in interventions than mothers, especially on homework assignments and discussions, and seem to prefer interventions focused on active involvement with their child (Magill-Evans et al., 2006; Tucker, Gross, Fogg, Delaney, & Lapporte., 1998). Active participation with or observation of the father's own child may be crucial for interventions targeting fathers. Involving the whole family system has shown to be more effective in creating change than including only the mother (Metzl, 1980).

The Current Study

There is strong evidence that mother autonomy support is related to concurrent and future self-regulation skills, and beginning evidence of similar relations for fathers. Very few studies have examined mother and father autonomy support simultaneously. By including both mothers and fathers, this study will provide a more complete picture of caregiving environments.

This aim of this study was to begin to understand if there is a causal effect of autonomy support on child behavior. There is evidence that interventions can change parenting behaviors, and in turn influence child outcomes. However, there is much to learn about what targets in parent behavior would be most useful to promote child self-regulation. Because parenting is a complex integration of attitudes and behaviors influenced by many factors at multiple levels of analysis, teaching and motivating parents to substantially change how they parent is a significant undertaking. Therefore, it is important to conduct proof-of-concept studies before launching a full parenting intervention. Previous studies support the idea that differences in children's behavior can be found between groups which vary in the quality of adult help given during a short-term interaction (Freund 1990; Gauvain & Rogoff, 1989).

In this study, we observed parents and children interacting in dyadic puzzle tasks that were slightly too hard for children to complete on their own. At baseline, parents were allowed to interact as they normally would. During the manipulation phase, parents were randomly assigned to receive instructions directing them to either act highly autonomy supportive (condition A for <u>A</u>utonomy) or highly controlling (condition C for <u>C</u>ontrol). By creating one condition designed to have a positive influence on parents (condition A) and one designed to have a negative influence (condition C), the goal was to create large differences between parents to provide information about the malleability of parent autonomy support behavior, as well as its influence on child behavior during and immediately after the manipulated interaction.

Hypotheses. The purpose of this study was to investigate the following three hypotheses.

1. Replication of previous findings.

A. Mothers and fathers will be equally effective at autonomy supportive parenting. Based on previous work (Connor, et al., 1997) I expected no differences between mother and father parenting at baseline, and no differences in their children's self-regulation during the baseline puzzle.

B. Parenting from both mothers and fathers will be related to child EF/self-regulation skills at baseline. I expected to replicate previous work showing that both mother (e.g., Bernier et al., 2010; Lengua et al., 2007; Merz et al., 2015; Razza & Raymond, 2013) and father (Meuwissen & Carlson, 2015) autonomy support would be related to concurrent child lab EF tasks.

2. The instructions during the manipulation phase will cause changes in parenting. Specifically, I hypothesized that in condition A parents (who received high autonomy support instructions) would become more autonomy supportive and less controlling, and condition C parents (who received high control instructions) would become less autonomy supportive and more controlling.

3. Child behavior will be affected by changes in quality of parenting. I expected that children in condition A would have better self-regulation during the task, and better performance on the solo puzzle and post-test EF task. I also expected that across conditions, increases in autonomy support would be related to high child self-regulation and EF, while increases in control and laissez faire would be related to poorer child performance.

Chapter 2. Method

Participants

The participants were 128 children (63 male, 65 female) and one of their parents (64 mothers, 64 fathers). The gender of the parent requested to participate was randomly assigned when the family was contacted. Recruitment was done through the ICD participant pool, and occurred primarily via email, or by phone if email was not available. The acceptance rate of fathers was lower than that of mothers, such that we had to contact 1.6 fathers for every 1 mother. An additional 7 children were recruited but excluded because of child noncompliance (N = 4), family language barriers (N = 2), or video malfunction (N = 1). Exclusion criteria were a diagnosed developmental disorder or birth more than three weeks premature.

Children averaged 39.5 months of age (see Table 3.1). They were primarily non-Hispanic Caucasian (90%). Sixty-two percent were first-born children, 32% were second-born, and 6% were third-born or later.

Participating parents averaged 35 years of age (see Table 3.1). Most parents were non-Hispanic Caucasian (92%) and had an education level of a college degree or higher (91%). Family income in the last year ranged from $25,000-$49,999 to $200,000 or more, with the mean and median corresponding to $125,000-$149,999 (mode = $100,000 - $124,999). All participants were biological parents of their child, and all lived with the child (2 had partial custody). Ninety-seven percent of the participating parents were currently married to the child’s other biological parent. When asked about the child’s primary caregiver, 45% reported mother, 36% reported mother and father, and 6%

reported father. One father and five mothers reported their occupation as an at-home parent.

Condition assignment. Parent-child dyads were randomly assigned to one of two conditions for this study, with the attempt to have a balance of father-son, father-daughter, mother-son, and mother-daughter dyads in each condition. Unevenness between groups was due to drop-outs and cancellations. Overall, there were 65 participants in condition A (high autonomy support/low control) and 63 in condition C (low autonomy support/high control). Figure 1 illustrates the number of participants in each subpopulation.

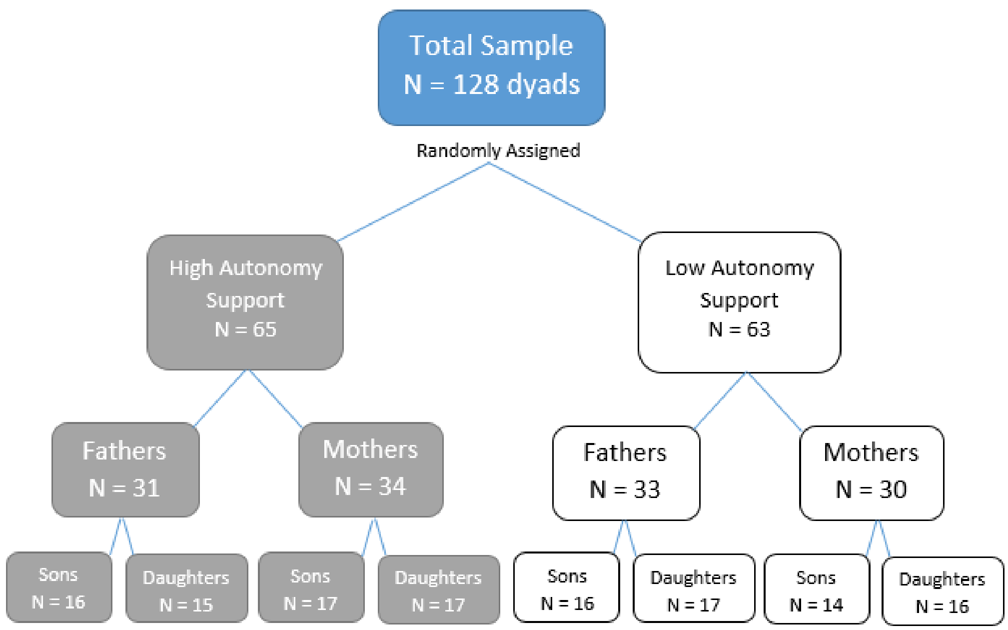

Figure 2.1. Diagram of participant groups.

Procedure

Each parent-child dyad took part in one videotaped laboratory session lasting approximately one hour. Sessions were administered by one of five female experimenters. The session consisted of three phases, illustrated in Table 2.1. In the baseline phase, the dyads completed a puzzle together that was coded for parenting quality and child self-regulation. We also tested parent and child EF, and child vocabulary. In the manipulation phase, parents received one of two sets of instructions, according to their group assignment. They were asked to follow these instructions as they completed another puzzle with their child. This puzzle was coded for parenting quality and adherence to instructions, and child self-regulation. Finally, in the solo post-test phase, children were asked to complete a similar puzzle without parent help, which was coded for overall child competence. Child EF was also re-tested. Each task is explained in detail below.

Table 2.1. *The Sequence of a Testing Session.*

	Phase 1: Baseline			Phase 2: Manipulation		Phase 3: Solo Post-test		
Consent	Dyad Puzzle	Child EF	Child Vocab & Parent EF	Instructions and Video Example	Dyad Puzzle	Child Solo Puzzle	Child EF	Debrief

Baseline phase.

Dyad puzzle. Dyads were given a 24-piece jigsaw puzzle to complete together. The instructions given by the experimenter were "*I want you to work on this puzzle just like you would if you were doing a puzzle together at home. I'll be back in a little bit!*" The experimenter returned after 10 minutes (*N* = 89), or when the dyad had completed the puzzle (*N* = 37; average time for all = 9:13, range = 5:00 – 10:00).

Minnesota Executive Function Scale. Children and parents were tested on EF using the Minnesota Executive Function Scale (MEFS; Carlson & Zelazo, 2014). The

MEFS is a measure of cool executive function, tapping working memory, inhibitory control, and set shifting. This task was adapted and expanded from the Dimensional Change Card Sort (Zelazo, 2006) by Carlson (Carlson & Schaefer, 2012; Beck, Schaefer, Pang & Carlson, 2011) and is administered as a computerized tablet game. Participants were shown two virtual boxes with target cards on them. They were instructed to sort cards into the boxes according to a dimension (e.g., shape or color) by dragging them on a touch screen. The MEFS consists of seven levels of increasing complexity. For each level, in part A participants were instructed to sort cards based on a specific dimension, and for part B they had to switch the sorting rule. Parents began at the higher levels, where they were required to switch flexibly multiple times. If participants performed accurately on at least 4 out of 5 trials for both rule sets, they passed the level and moved to a more difficult level. They continued on to higher levels until they failed. If participants failed the first level administered, they moved down to the previous level until they passed. Test form A was administered to children and parents in the baseline phase. MEFS tests took approximately 5 minutes.

Stanford-Binet Verbal Abilities subtest. The verbal subscale of the Stanford-Binet intelligence test was administered using standardized procedures (Roid, 2005). In this test of child vocabulary, items progressed in difficulty from pointing at pictures, to naming objects and pictures, to defining words of increasing difficulty. Children received a score of 0, 1, or 2 on each item based on the quality of the response, as specified by the manual. Children proceeded until 4 consecutive items were scored 0. The Stanford-Binet verbal test correlates highly with other tests of child verbal ability, such as the Peabody

Picture Vocabulary Test (Hodapp, 1993), and is appropriate for children beginning at two years old (Roid, 2005). Tests took approximately 5 minutes.

Manipulation phase.

Condition instructions. Parents were then told they were to do another puzzle with their child, but this time there were some specific instructions to follow. Table 2.2 shows the instructions given to parents in condition A, and Table 2.3 shows instructions given to parents in condition C. Parents were given a copy of these instructions and the experimenter summarized each point verbally.

Table 2.2. *Condition A Instructions*

Parent Instructions: Version A
The goal of this task is to *let your child do as much of the puzzles as he/she can* and only help when needed. We want to see how children can learn by doing. So we are asking you to: 1. **Do not put any of the blocks in place yourself.** You may give *verbal help*, but your child must do all of the placing of the pieces. 2. **Give only as much help as your child needs.** Carefully *watch your child* to see what she/he can do on his own. Try to *ask questions* rather than give a lot of directions. These pictures are difficult, so your child will need your assistance, and you can help enough so your child doesn't get frustrated. 3. **Let your child make as many decisions as he/she can.** You are in no rush to complete these, we want you to focus on letting your child do the work rather than getting them done quickly. *Give your child lots of time* to think about each hint or instruction you give before saying anything else.

Table 2.3. *Condition C Instructions*

Parent Instructions: Version C
The goal of this task is to give your child a lot of help so you can *complete as many of these designs as possible*, like a race. You only have 10 minutes. We want to see how children can learn from being instructed by their parent.
So we are asking you to:
1. **Start with the bottom pieces and work your way up** for each picture. Walk your child through each step so they are able to *follow this structure* and get the pictures done *quickly*.
2. **Give a lot of demonstrations.** *You should place the first few blocks* in each design yourself to get it started and show your child how to do it, and continue to put in the blocks when your child needs help.
3. **Don't let your child struggle in the task**, so give a lot of *help both verbally and physically* so you keep making progress on the puzzle. Focus on giving a lot of *specific directions* to help your child learn the most

Parents were then shown one of four videos, matched to parent gender and condition. The videos were created for the study to show examples of the type of parenting expected for the two conditions. The actors in the videos were one male and one female preschool teacher, who each created a condition A and condition C video. Four different preschool children (not part of the current study) participated in the videos.

Once the parents had received their instructions and seen the video, they were asked if they had any questions. They were also told, "*This may or may not be how you normally parent, but we'd like you to try to follow these instructions. However, if at any* *point you or your child feel uncomfortable, you can of course do whatever you need to do."*

Manipulation dyad puzzle. The dyads were then given designs to make with shape blocks ("Learning Resources Plastic Pattern Blocks 0.5 cm", Toys R Us). There were eight designs to choose from (e.g., car, flower). Each design was shown in a color picture that was scaled smaller than the blocks. There was a corresponding "building mat" which was an outline of the entire picture that was of equal scale to the blocks. Parents were told they should try to build the shapes on the mat to look exactly like the small colored picture. Figure 2.2 shows an example of the materials. The dyad was given a large bucket of flat plastic shapes (e.g., yellow hexagons, green triangles, orange squares), and was told they could choose whichever pictures they wanted to build. Condition A parents were told, *"You can continue doing pictures until I get back,"* and parents in Condition C were told, "*Try to do as many as pictures as you can until I get back."* The experimenter then left the room and returned after 10 minutes.

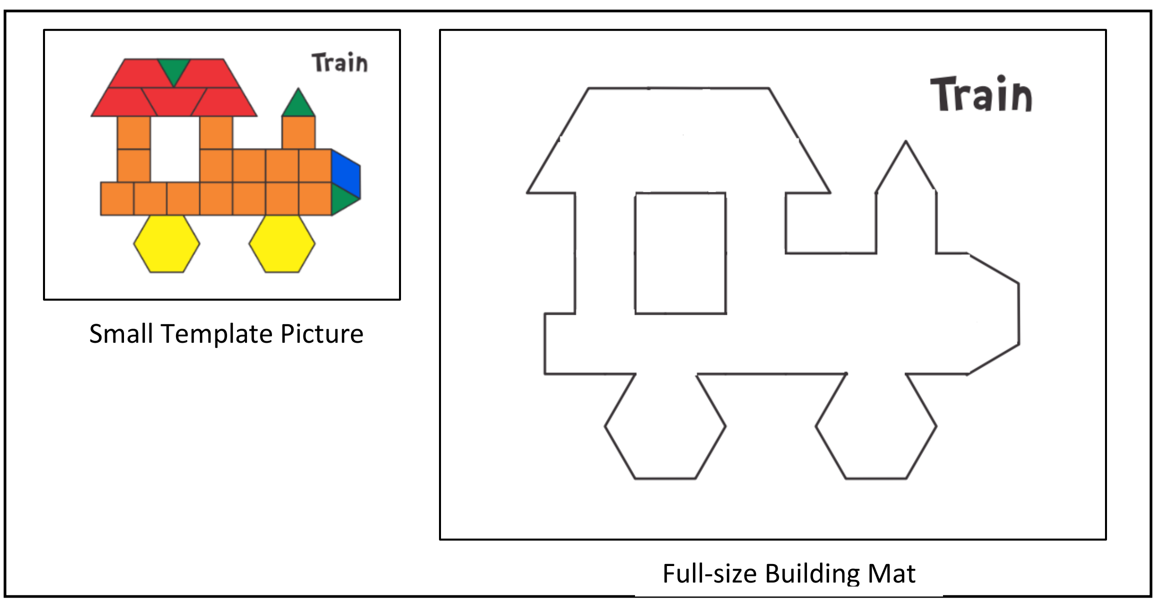

Figure 2.2. Example of materials for the train picture

Solo post-test phase. For this phase, the parent either left the room if that was acceptable to the child (N = 81) or was seated with their back to the child at a desk behind the child, and told to refrain from giving the child feedback (N = 37).

Child solo puzzle. Children were told they were going to make another picture with blocks, as they had just done with their parent. Children were given a choice between two new pictures. (Ten children (5 in each condition) refused to choose a picture or start the task and were not scored for the solo puzzle.) When the children chose a picture, the building mat was set directly in front of them and the small template picture above it. The experimenter said, "*I want you to show me how you can make this picture. What do you do first to make the [cake/duck]?*" The experimenter then waited until children gave a verbal response or placed a piece, and then said, "*And what do you do next?*" After children had made two statements or placements, the experimenter explained she had some other work to do and was going to sit in a chair away from the table. She said, "*I want to see how you can make this picture by yourself. I want you to try your best, but if you ever want to be done trying, you just let me know and then we'll put the blocks back in the bucket.*" She then left the table and sat at a chair in the corner of the room.

Children then worked on the puzzle alone. If they finished their first picture before 10 minutes had passed, they were given the option to try the second puzzle. The task ended for one of the following reasons:

1. The child had worked on the puzzle for 10 minutes.
2. The child spontaneously stated they were done or they no longer wanted to work on the puzzle.

3. If the child did no work on the puzzle for 60 seconds (did not place or remove a piece from their picture) the experimenter asked the child, *"Would you like to keep working on your picture, or would you like to be done now?"* and ended the task if the child stated he or she would like to be done.

Child Minnesota Executive Function Scale post-test. Children were given Form B of the MEFS, which has different pictures but the exact same levels and rules. Children started at the highest level they had passed on their baseline MEFS and proceeded up or down through the levels in the standard way depending on their performance.

Debriefing. At the end of the session, parents were informed about the design of the study, the instructions given to the other group, and about the hypothesis that children would benefit more from the parenting behaviors outlined in condition A.

Questionnaires. Three questionnaires were sent to the parents via email before the session. Parents had the option to complete them either before or during the session.

Demographics Questionnaire. Parents completed a survey about demographics regarding their child, their co-parent, and themselves.

Parent Involvement Questionnaire (Meuwissen & Carlson, 2015). To quantify a parent's involvement with their child, parents answered questions about how frequently they engaged in a number of different activities with their child. The survey included items related to cognitive stimulation (e.g., read books, sing songs or rhymes), warmth (e.g., tell child you love him/her, show physical affection), and play (e.g., play inside with toys or games, play imaginary games). The questionnaire included 10 items rated on a 5-point scale (*never* to *more than once a day*). An involvement score was created by summing the ratings for each question, giving a possible total of 50.

Children's Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006). Parents also completed the Children's Behavior Questionnaire Very Short Form with EF Extension, to measure child self-regulatory behavior outside of the laboratory. This questionnaire requires parents to rate their child's typical behavior in everyday situations. Parents rated 50 items on a scale of 1 (*extremely untrue of your child)* to 7 (*extremely true of your child*). For this study I was primarily interested in the EF subscale, which was comprised of 14 items such as "Listens without interrupting" "Cannot wait to open presents" (reverse-scored), and "When angry or frustrated, can keep emotions under control." The total score for the EF subscale was an average of these 14 items.

Data Coding

The variables used from each task are described below. When rated variables were conferenced, final scores were agreed upon after discussion of differences.

Stanford Binet Verbal test. The child's raw score of number of items answered correctly was used.

MEFS: Child pre-test and post-test, parent test. For each MEFS test participants receive a score between 0 and 100, which is the total score of correct trials adjusted for reaction time, scored by the MEFS software. Two children who scored 0 on both baseline and post-test were excluded as they seemed to not understand the task.

Dyad puzzles.

Child self-regulation: Baseline and manipulation puzzles. Children were rated on 5 scales reflecting aspects of self-regulation during the dyadic puzzles (created for this study; full coding scheme is given in Appendix A). Each scale was rated from 1-5. The following scales were coded:

1. Child's use of help given: the degree to which the child cooperates with the parent and uses their help appropriately vs. resists the parent and is stubborn or perseverates on own ideas.

2. Goal Directed Behavior: the degree to which the child has a logical and organized approach to the puzzle vs. acts randomly and is not able to evaluate next steps.

3. Focus: the degree to which the child stays focused on the task of their own accord, vs. is easily distracted and does not stay focused on task even after prompts.

4. Persistence: the degree to which the child tries hard and persists through difficulty, vs. becomes frustrated and gives up easily.

5. Child Self-Efficacy: the degree to which the child sees self as a main actor in the puzzle and takes initiative and responsibility, vs. relies on parent for all direction.

Child Self-Regulation Composite. For both the baseline and manipulation puzzles, all 5 subscales were significantly intercorrelated (Baseline: *r*s ranged from .304 to .555, Manipulation: *r*s ranged from .451 to .770). When entered into a principle components analysis (PCA), all subscales loaded on the first component (Baseline: .692 and above, Manipulation: .640 and above). Therefore, a composite was created by computing the mean score of the 5 subscales. The alpha for the composite was .807 for the baseline puzzle and .876 for the manipulation puzzle.

All videos were coded by one of 4 trained coders. Twenty-five percent of the videos were double coded by the primary coder (Meuwissen). The average reliability on the self-regulation composite for all coders was *ICC* = .940; each individual coder was reliable at or above *ICC* = .90 with the primary coder.

Parenting Quality: Baseline and manipulation puzzles. Videos of the puzzles were coded using the Whipple, Bernier, and Mageau (2011) parenting quality coding scheme. In this scheme, parent behavior is coded on three dimensions: autonomy support, control, and laissez faire. A rating from 1-5 is assigned for each dimension in four categories: 1) Concern for child's competence and autonomy, 2) Verbalizations, 3) Flexibility and perspective-taking, and 4) Following child's pace and giving choices. The flexibility/perspective-taking category was only rated if the child deviated from the task (attempted to give up or engage in off-task behavior) at some point (11% of baseline videos, 30% of manipulation videos).

Behaviors that were given high autonomy support ratings included adapting the task to the child's level when it became too difficult; giving encouragement, praise, and useful suggestions with a positive tone; taking the child's perspective and trying multiple strategies if the child deviated from the task; and letting the child play an active role and make choices. Behaviors that were given high control ratings included intervening too soon and too much; giving unnecessary instructions or using a stern or sarcastic tone; rigidly not tolerating any departure from the task; and the parent being the main actor in making choices about the task. Behaviors that were given high laissez faire ratings included letting the child struggle in the task; giving few verbalizations or using a monotone voice; not making an effort to regain child's attention if the child deviated; and being uninvolved with the child during the puzzle.

Parenting quality composites. As is standard for this coding scheme, I combined the ratings into 3 composites: autonomy support, control, and laissez faire. Composites were made by taking the average of the ratings for each dimension. For videos in which the child deviated, this was a composite of 4 ratings, and for videos in with the child did not deviate, flexibility was not coded and the composite included 3 ratings. Alphas were computed for each scale with and without the flexibility variable, shown in Table 2.4.

All videos were coded by one of 4 trained coders. Twenty percent of the videos were double coded. For autonomy support, the average reliability for all coders was *ICC* = .837, and each individual coder was reliable at or above *ICC* =.702 with the primary coder (Meuwissen). For control, the average reliability was *ICC* =.889 and each individual coder was reliable at or above *ICC* =.810. For laissez faire, the average reliability was *ICC* =.700, and each individual coder was reliable at or above *ICC* =.625.

Table 2.4. *Composite Alphas of Parenting Quality Scales*

	Baseline Puzzle		Manipulation Puzzle	
	Without Flexibility (N = 126)	With Flexibility (N = 14)	Without Flexibility (N = 128)	With Flexibility (N = 38)
Autonomy Support	.826	.845	.826	.811
Control	.896	.604	.896	.846
Laissez Faire	.582	.706	.736	.508

Parent adherence to instructions: Manipulation puzzle. Manipulation puzzles were also coded with a scheme designed to measure how well parents followed the instructions they were given. The major differences between the two sets of instructions were how quickly the puzzles were to be completed, how much the parent should physically intervene on the puzzle, and the type of verbal help the parent should give. Each manipulation puzzle video was watched and the following behaviors were counted (the full coding scheme is given in Appendix B):

1. Dyad completes a picture.

2. Parent touches a block: one touch was coded each time a parent adjusted pieces on the puzzle, handed the child a piece, or created a pile of the color the child needed on the table.

3. Parent places a block: one placement coded each time a parent puts a correct shape on the puzzle or moves a child's incorrect try to the correct place.

4. Open-Ended Questions: each time the parent asked a question or gave a prompt that required an independent thought from the child, such as "What is the hat made of?," "What do we need next?," or "Do you think that matches the picture?"

5. Direct Instructions: each time parent made a statement or prompt giving the child a specific action to do, such as "Put a triangle in the middle," or , "Can you put two trapezoids right here?"

Control Adherence Composites. All 5 items were significantly intercorrelated (*r*s ranged from .207 to .743). When entered into a PCA, all subscales loaded on the first component at .491 and above. All items loaded positively except Open-Ended Questions. Therefore, a composite was made by computing the average of the Z-scores on the 5 items, with Open-Ended Questions reverse scored. This Control Adherence composite reflected the degree to which the parent followed the instructions given in condition C (negative values would be expected for parents in condition A). The alpha for the composite was .805. An additional composite to reflect the degree to which the parent followed the instructions given in their own condition was made by reversing the sign of the composite score for parents in Condition A. Thus, in the Follow Instructions composite, more highly positive numbers reflected more closely following the instructions of the assigned group.

All videos were coded by one of 4 trained coders. Twenty-five percent of the videos were double coded by the primary coder (Meuwissen). The average reliability on the Parent Adherence Control composite for all coders was *ICC* =.840, each individual coder was reliable at or above *ICC* = .690 with the primary coder.

Child solo puzzle. Videos of the child solo puzzle were coded for the child's overall competence, which reflected their understanding and success at the puzzle, as well as their persistence and regulation (created for this study; full coding scheme is given in Appendix C).

The following behaviors were coded:

1. Time worked on the puzzle: number of seconds from when the experimenter left the table to when the child made their last move on the puzzle.

2. Pieces on mat [Yes/No]: child placed at least one block onto the building mat

3. Use of template picture: 0 = child does not look at picture, 1 = child may glance at picture but does not use it to correct mistakes, 2 = child looks at picture and matches it when building.

4. Number of pictures child finishes (0, 1, or 2). If the child believes they are done, even though there are mistakes or pieces missing, this still counts as being finished.

5. Number of puzzle blocks placed correctly at the end: The total for both pictures if both were attempted.

6. Reason child ends the task: Frustrated, bored, finished, or other

7. Goal Directed Behavior (rated 1-5): the degree to which the child has a logical and organized approach to the puzzle vs. acts randomly and is not able to evaluate next steps.

8. Focus (rated 1-5): the degree to which the child stays focused on the task of their own accord, vs. is easily distracted or gets off-task.

9. Persistence (rated 1-5): the degree to which the child tries hard and persists through difficulty, vs. becomes frustrated and gives up easily.

The final 3 scales (7, 8, 9) were automatically given a score of 1 if the child did not work on the puzzle for at least 120 seconds.

Child Solo Puzzle Composite: The variable Pieces on Mat was only significantly correlated with one other item (number of blocks placed correctly) and the variable Reason Ended was categorical, so these were not included in the composite. All other variables were significantly intercorrelated (*r*s = .303 to .805). When entered into a PCA, all items loaded on the first component at .625 and above. A composite was made by computing the mean of the Z-scores of the items. The alpha for this composite was .915.

All videos were coded by one of 3 trained coders. Twenty-five percent of the videos were double coded by the primary coder (Meuwissen). The average reliability on the child solo puzzle composite for all coders was *ICC* =.978, each individual coder was reliable at or above *ICC* =.967 with the primary coder.

Chapter 3. Results

Descriptive Statistics

Table 3.1 presents descriptive statistics for the child and parent variables in the study.

Bivariate Correlations

I next examined whether sociodemographic variables were related to the main parent and child variables (see Table 3.2). Because of their relations with multiple main variables, child vocabulary, child sex, parent education, and parent involvement were used as covariates in subsequent regression analyses. Bivariate correlations between the main variables in the study are shown in Table 3.3.

Table 3.1. *Descriptive Statistics of Study Variables*

	N	Range	Mean	SD	Theoretical Range	Distribution Description	Skewness/ SE(skewness)
Questionnaires							
Child Age (months)	128	37 – 43	39.48	1.52	NA	Normal	.687
Parent Age (years)	128	27 – 46	35.07	3.91	NA	Normal	1.94
Parent Involve	128	20-50	39.53	6.19	0-50	Normal	-1.40
CBQ Executive Function	128	2.36 – 6.07	4.31	.67	1-7	Normal	-1.15
Baseline Phase							
SB Vocab	126	3 – 24	16.06	3.73	0-44	Normal	-1.51
Base Child MEFS	123	1 – 53	33.99	13.89	0-100	L skewed	-3.14*
Parent MEFS	125	45-95	86.48	14.24	0-100	L skewed	-8.65*
Base AS	126	2.33-5.00	4.13	.68	1-5	L skewed	-2.63*
Base Control	126	1.00-4.00	1.67	.67	1-5	R skewed	4.83*
Base Laissez Faire	126	1.00-2.67	1.25	.39	1-5	R skewed	7.88*
Base Self-Reg	127	1.40 – 5.00	4.08	.61	1.00-5.00	L skewed	-6.93*
Manipulation Phase							
Control Adherence	128	-1.09 – 1.78	.00	.75	Avg of Z scores	Bimodal	2.17*
Follow Instruct	128	-.51 – 1.78	.61	.44	Avg of Z scores	Normal	-.720
Manip AS	128	1.33-5.00	3.45	.94	1-5	Normal	-.379
Manip Control	128	1.00-4.67	2.18	1.10	1-5	Bimodal	1.79
Manip Laissez Faire	128	1.00-4.33	1.46	.61	1-5	R skewed	8.55*
Manip Self-Reg	128	1.00-5.00	3.45	.94	1-5	L skewed	-2.99*
Post Test Phase							
Child Solo Puzzle	118	-1.07 – 1.86	.00	.81	Avg of Z scores	Bimodal	1.46
Post Child MEFS	120	3-69	34.57	15.08	0-100	L skewed	-1.99*

*$p < .05$, **$p < .01$.
Note: SB = Stanford-Binet. CBQ = Child Behavior Questionnaire. MEFS = Minnesota Executive Function Scale. AS = Autonomy Support. Self-Reg = Self-Regulation

Table 3.2. *Correlations between Main Variables and Control Variables*

	SB Vocab	Child Gender	Parent Gender	Child Age	Parent Education	Income	Parent Involve
Baseline Phase							
Base Child MEFS	.248**	.079	.089	.022	.030	.116	.043
Parent MEFS	-.107	-.001	.061	-.027	.026	-.047	.169[a]
Base AS	.066	-.016	.057	-.030	.239**	.030	.251*
Base Control	-.067	.117	-.036	-.005	-.248**	-.021	-.192*
Base Laissez Faire	-.057	-.198*	-.009	.023	.014	-.060	-.075
Base Self-Reg	.257**	-.032	-.056	.154[a]	.007	.102	.017
Manipulation Phase							
Control Adherence	-.145	.031	-.002	-.078	-.117	.036	-.113
Follow Instruct	-.038	.107	.179*	-.127	.067	-.135	.168[a]
Manip AS	.118	.093	-.088	.104	.139	.030	-.033
Manip Control	-.099	-.026	-.027	-.028	-.179*	.009	-.106
Manip Laissez Faire	.061	.024	.198*	-.101	.061	-.056	.218*
Manip Self-Reg	.204*	.128	-.016	.073	-.050	-.062	-.198*
Post Test Phase							
Child Solo Puzzle	.070	.034	.008	.070	-.046	.062	-.156[a]
Post Child MEFS	.340**	.153[a]	.068	.129	.006	.091	.072

[a]$p < .10$, *$p < .05$, ** $p < .01$

Note: SB = Stanford Binet. MEFS = Minnesota Executive Function Scale. AS = Autonomy Support. Self-Reg = Self-Regulation. Manip = Manipulation.

Table 3.3. *Bivariate Correlations of Main Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Base Child MEFS	--														
2. Parent MEFS	.045	--													
3. Base AS	.086	.090	--												
4. Base Control	-.093	-.075	-.820**	--											
5. Base LF	.025	.045	-.260**	-.206*	--										
6. Base Self-Reg	.007	.111	.313**	-.136	-.263**	--									
7. Control Adherence	.011	.046	-.007	.039	-.090	-.048	--								
8. Follow Instruct	-.068	-.026	.078	-.039	-.046	-.030	.282**	--							
9. Manip AS	-.030	-.031	.007	.000	.009	.120	-.599**	-.105	--						
10. Manip Control	.004	.002	-.092	.111	-.060	-.175*	.815**	.094	-.786**	--					
11. Manip LF	.091	.074	.078	-.078	.013	.098	-.362**	.058	-.194*	-.383**	--				
12. Manip Self Reg	.155[a]	-.007	.075	-.032	-.087	.232**	.278**	.067	.080	.160[a]	-.367**	--			
13. Child Solo Puzzle	.212*	.095	.094	-.128	.025	.124	.196*	.099	-.072	.071	.035	.336**	--		
14. Post Child MEFS	.779**	.025	.040	-.054	-.038	-.015	-.020	-.074	.014	-.003	.066	.204*	.209**	--	
15. Condition	.070	.006	-.057	.040	.039	-.100	.811**	.022	-.659**	.839**	-.355**	.251**	.152	.084	--

[a]*p* < .10, **p* < .05, ** *p* < .01

Note: MEFS = Minnesota Executive Function Scale. AS = Autonomy Support. LF = Laissez Faire. Self-Reg = Self-Regulation. Manip = Manipulation.

Validity of New Variables

A number of new measures were created for this study: ratings of child self-regulation in the dyad puzzles, ratings of child competence during the solo puzzle, and ratings of parent adherence to instructions. To address the validity of the child behavior ratings, I compared them to established measures of EF and verbal skills (see Table 3.4) Baseline self-regulation was related to verbal skills, but not to any other measures of EF. Manipulation self-regulation was related to verbal skills, as well as to the pre- and post-test MEFS and CBQ EF, although those relations were all marginal after taking verbal skills into account. Child solo puzzle competencewas related to both pre- and post-test MEFS scores, but only marginally to baseline child MEFS after accounting for child verbal ability.

Table 3.4. *Correlations of New Child Variables with Accepted Measures of Executive Function*
(Bivariate/Controlling for Verbal)

	Base Child MEFS	Post Child MEFS	CBQ EF	SB Verbal
Base Self Reg	.007/-.030	-.015/-.117	.017/.001	.257**
Manip Self Reg	$.155^a/.173^a$	$.204^*/.175^a$	$.179^*/.170^a$	.204**
Child Solo Puzzle	$.212^*/.169^a$	.209*/.157	.090/.086	.070

$^a p < .10$, $^*p < .05$, $^{**} p < .01$
Note: MEFS = Minnesota Executive Function Scale. CBQ EF = Child Behavior Questionnaire Executive Function. SB = Stanford Binet. Manip = Manipulation. Self-Reg = Self-Regulation.

To address the validity of the parent adherence measure, I examined its relation with condition assignment and concurrent established measures of parenting. As seen in Table 3.2, parent adherence was strongly related to condition assignment and control (*r*s above .8), as well as moderately correlated in the expected directions with autonomy support and laissez faire. The strong correlation between parent adherence and control suggests these two variables are measuring very similar constructs, using counts of behavior and global ratings of behavior, respectively.

Random Assignment Check

To check that the random assignment created groups which did not differ on baseline variables, I performed a series of t-tests (see Table 3.5). Condition A parents had higher levels of education and marginally higher parent involvement, both with small effect sizes. These variables were included as covariates in future regression analyses. There were no differences in parenting quality or child measures.

Table 3.5. *Invariance of Randomly Assigned Groups on Baseline Variables*

	N		*Mean*		*SD*			
	Condit. A	Condit. C	Condit. A	Condit. C	Condit. A	Condit. C	*t*	Cohen's *d*
Parent Variables								
Parent Education	63	62	5.98	5.58	1.08	1.11	2.06*	.365
Parent Income	65	62	5.62	5.53	2.10	1.75	.24	.047
Parent Involve	65	63	40.57	38.44	6.32	5.90	1.97[a]	.348
Base AS	64	62	4.17	4.09	.58	.73	.63	.122
Base Control	64	62	1.64	1.70	.63	.71	-.44	.089
Base LF	64	62	1.23	1.26	.34	.43	-.44	.077
Parent MEFS	64	61	86.39	86.57	14.70	13.66	-.07	.013
Child Variables								
Child Age	65	63	39.63	39.31	1.43	1.60	1.17	.211
Child Self-Reg	65	62	4.14	4.02	.59	.63	1.12	.197
Child MEFS	61	62	33.02	34.95	14.92	12.85	-.771	.139
Child SB Verbal	64	62	16.52	15.58	3.66	3.77	1.31	.253
Child CBQ EF	65	63	4.26	4.36	.75	.59	-.84	.148

[a]*p* < .10, **p* < .05, ** *p* < .01
Note: Condit. = Condition. AS = Autonomy Support. LF = Laissez Faire. MEFS = Minnesota Executive Function Scale. Self-Reg = Self-Regulation. SB = Stanford Binet. CBQ EF = Child Behavior Questionnaire Executive Function.

Hypothesis 1: Replication of Previous Findings

Part A. Mothers and fathers will be equally effective at autonomy supportive parenting at baseline. Table 3.6 shows *t*-tests examining mean differences between mothers and fathers. The Connor et al. (1997) finding that parents were equally effective at scaffolding was replicated in that no differences were found in mother vs. father autonomy support, control, or laissez faire parenting at baseline, nor child self-regulation when working with a mother vs. a father. Mothers reported more involvement with their children than fathers, with a medium effect size.

Table 3.6. *Differences between Mothers and Fathers*

	N		*Mean*		*SD*			
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	*t*	Cohen's *d*
Demographic Variables								
Parent Age	64	64	35.45	34.69	4.04	3.76	1.11	.195
Parent Education	61	64	5.64	5.92	1.14	1.07	-1.43	.253
Family Income	63	64	5.52	5.63	2.11	1.75	-.29	.057
Parent Involve	64	64	37.50	41.55	5.56	6.15	-3.90**	.691
Parenting Variables								
Base AS	64	62	4.10	4.17	.68	.63	-.64	.107
Base Control	64	62	1.69	1.65	.72	.62	.40	.060
Base Laissez Faire	64	62	1.25	1.24	.37	.40	.10	.026
Parent MEFS	64	61	85.64	87.36	14.26	14.09	-.68	.121
Manip AS	64	64	3.54	3.37	.93	.94	1.00	.182
Manip Control	64	64	2.21	2.15	1.08	1.13	.31	.054
Manip LF	64	64	1.34	1.58	.46	.71	-2.26*	.401
Cont Adherence	64	64	.00	-.00	.71	.80	.026	.005
Follow Instruct	64	64	.53	.68	.46	.40	-2.05*	.363
Child Variables								
Self-Reg Base	64	63	4.11	4.04	.60	.63	.62	.114
Self-Reg Manip	64	64	3.47	3.44	1.05	.85	.19	.031
Child Solo Puzzle	62	56	-.01	.01	.83	.80	-.09	.016

[a]$p < .10$, *$p < .05$, ** $p < .01$
AS = Autonomy Support. LF = Laissez Faire. Cont Adherence = Control Adherence. Self-Reg = Self-Regulation. Manip = Manipulation

Part B. Parenting from both mothers and fathers will be related to child EF/self-regulation skills at baseline. Child skills at baseline were measured using the MEFS and ratings of self-regulation during the puzzle. Baseline child MEFS was not bivariately correlated with measures of baseline parenting (see Table 3.3). Child self-regulation during the puzzle was correlated with concurrent autonomy support and laissez faire parenting (see Table 3.3). To further investigate relations between baseline parenting and child outcomes, I conducted regressions predicting child MEFS and baseline self-regulation. Because control was collinear with autonomy support ($r(124) = -.820$ $p < .01$) and not correlated with either child outcome, it was not included in the following regressions.

The regression analysis predicting baseline child MEFS (see Table 3.7) showed that child vocabulary was the only significant predictor, but that the effect of autonomy support marginally varied by parent gender. After accounting for the other variables in Model 3, mother autonomy support was associated with child baseline MEFS (slope = 4.60, R^2 = 5.1%) marginally more strongly than father autonomy support (slope = -0.70, R^2 = 0.1%).

Table 3.7. *Regression Predicting Baseline Child MEFS*

	Beta	R^2	ΔR^2	*F* Change	*p*
Model 1		6.7%		2.07	.090[a]
Stanford Binet Vocab	.243**				
Child Gender	.067				
Parent Education	.020				
Parent Involve	.019				
Model 2		8.3%	1.6%	.641	.590
Stanford Binet Vocab	.240**				
Child Gender	.088				
Parent Education	.000				
Parent Involve	-.024				
Parent Gender	.082				
Base Autonomy Support	.094				
Base Laissez Faire	.079				
Model 3		11.1%	.2.8%	1.75	.179
Stanford Binet Vocab	.229*				
Child Gender	.079				
Parent Education	.021				
Parent Involve	-.136				
Parent Gender	-1.50[a]				
Base Autonomy Support	-.435				
Base Laissez Faire	-.290				
BaseAS*PGender	1.38[a]				
BaseLF*PGender	.566				

[a]$p < .10$, *$p < .05$, ** $p < .01$

Note: MEFS = Minnesota Executive Function Scale. BaseAS*PGender = Interaction between baseline autonomy support and parent gender. BaseLF*PGender = Interaction between baseline laissez faire and parent gender.

Table 3.8 shows the regression predicting baseline child self-regulation. In model 2, parent autonomy support and laissez faire both predicted above and beyond the significant effect of child vocabulary. Model 3 shows that effects of parenting did not differ by parent gender.

Table 3.8. *Regression Predicting Baseline Child Self-Regulation*

	Beta	R^2	ΔR^2	F Change	p
Model 1		7.5%		2.41	.053[a]
Stanford Binet Vocab	.261**				
Child Gender	-.029				
Parent Education	.018				
Parent Involve	-.092				
Model 2		22.0%	14.5%	7.10	.000**
Stanford Binet Vocab	.237**				
Child Gender	-.056				
Parent Education	-.038				
Parent Involve	-.154[a]				
Parent Gender	-.027				
Base Autonomy Support	.294**				
Base Laissez Faire	-.197*				
Model 3		22.9%	0.9%	.690	.504
Stanford Binet Vocab	.242**				
Child Gender	-.047				
Parent Education	-.039				
Parent Involve	-.099				
Parent Gender	.735				
Base Autonomy Support	.613*				
Base Laissez Faire	-.152				
BaseAS*PGender	-.823				
BaseLF*PGender	-.076				

[a]$p < .10$, *$p < .05$, ** $p < .01$
Note: BaseAS*PGender = Interaction between baseline autonomy support and parent gender. BaseLF*PGender = Interaction between baseline laissez faire and parent gender.

Summary of hypothesis 1. In my test of hypothesis 1, MEFS scores were not predicted by parenting, however, the effect of mother autonomy support was marginally stronger than that of fathers on this variable. Child self-regulation within the puzzle task was related to concurrent parent autonomy support and laissez faire, and these effects did not differ by parent gender.

Hypothesis 2: The instructions during the manipulation phase will cause changes in parenting.

For the main purpose of the study, I investigated how changes in parenting between baseline and manipulation differed by condition using repeated measure ANOVAs. *T*-tests have previously been presented showing that none of the parenting variables differed between conditions at baseline (Table 3.5). Post-hoc *t*-tests showed that parents in condition A and condition C differed on each measure of parenting during the manipulation puzzle, all in the expected direction (autonomy support: t (126) = 9.83, d = 1.74; control: t (126) = -17.34, d = 3.04; laissez faire: t (126) = 4.26, d = .75; control adherence: t (126) = -15.57, d = 2.77. All ps < .01). Results of the ANOVAs and post-hoc paired *t*-tests investigating if each condition changed over time are shown in Table 3.9 and illustrated in Figure 3.1. Parents in condition A became less controlling and more laissez faire, while parents in condition C become less autonomy supportive and more controlling.

Table 3.9. *Condition Differences in Changes in Parenting*

	F			Condition A				Condition C			
	Time	Condition	Time x Condition	*M* Base	*M* Manip	Paired *T*	Cohen's d^+	*M* Base	*M* Manip	Paired *T*	Cohen's d^+
Autonomy Support	61.17**	58.16**	42.10**	4.17	4.06	.95	.112	4.09	2.83	10.08**	1.29
Control	52.13**	124.50**	148.12**	1.64	1.28	4.34**	.564	1.70	3.11	-11.71**	1.46
Laissez Faire	11.74**	12.50**	17.18**	1.23	1.67	-4.94**	.648	1.26	1.24	.57	.03

Note: Manip = Manipulation

[+]Cohen's *d* corrected for dependence between means (Morris & DeShon, 2002)

[a]$p < .10$, *$p < .05$, ** $p < .01$

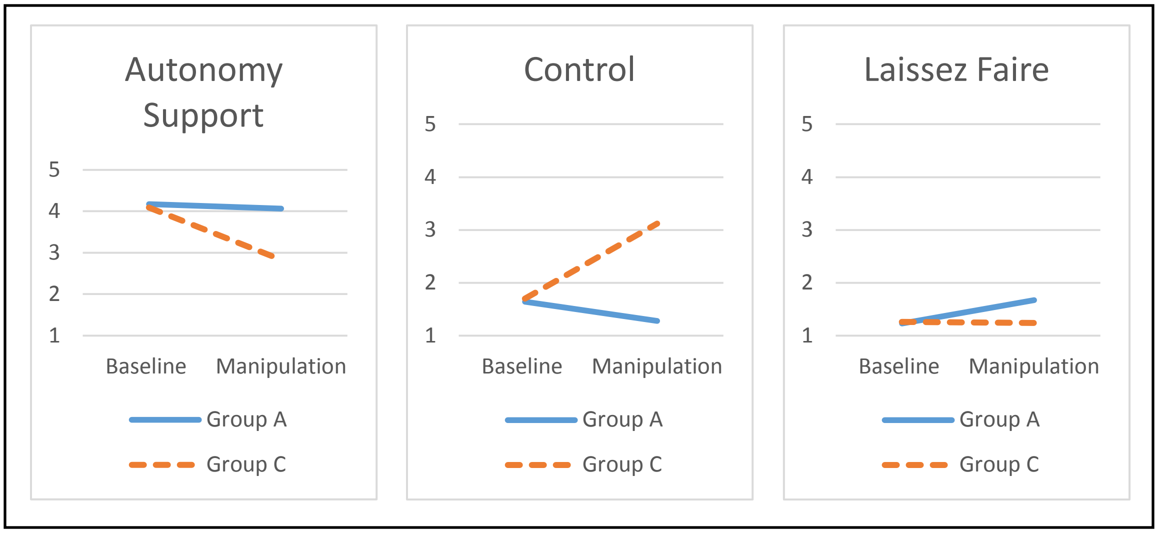

Figure 3.1. Graphic results of parenting quality repeated measure ANOVAs.

When considering parent gender differences during the manipulation puzzle, Table 3.6 showed that mothers more closely adhered to their condition instructions and had higher levels of laissez faire than fathers. To further investigate these results, I performed an ANOVA testing the effects of parent gender and condition assignment on change in laissez faire (corrected for baseline, calculated (laissez faire manip – laissez faire base)/laissez faire base). The main effects of parent gender ($F(1, 122) = 1.27$, $p > .05$) and condition ($F(1, 122) = 3.83$, $p > .05$) were not significant, but there was a marginally significant interaction between them ($F(1, 122) = 3.57$, $p = .061$; see Figure 3.2). Post hoc *t*-tests showed that in condition A, mothers had larger increases in laissez faire than fathers, while in condition C, there was no difference (see Table 3.10).

Table 3.10. *Post-hoc t-tests examining effects of condition and parent gender on laissez faire change.*

	Condit A.	Condit C.	*t*
Mothers	.620	.072	3.29**
Fathers	.226	.049	1.67
t	-2.47*	-.213	

[a]*p* < .10, **p* < .05, ** *p* < .01

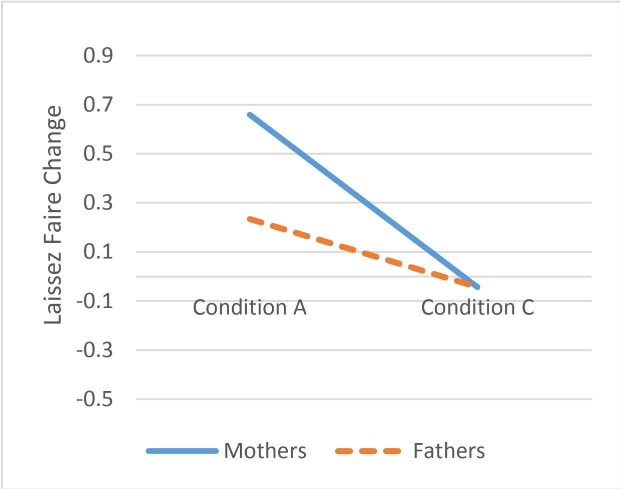

Figure 3.2. ANOVA examining effects of condition and parent gender on change in laissez faire.

Exploratory analyses. A primary aim of this study was to inform future interventions teaching parents to be more autonomy supportive. Although, as a group, condition A did not increase in autonomy support as predicted, 48% of parents within condition A did show an increase. Because I had a specific interest in parents who benefited from the condition A instructions, I performed exploratory logistic regressions examining factors that predicted if a parent in condition A would show a positive change vs. negative change/no difference in autonomy support (see Table 3.11). Each baseline parenting quality dimension was entered in a separate regression, as the three dimensions may be differently inter-related in future studies, and I was interested in the effects of each dimension alone. Because the following analyses were exploratory, a $p < .01$ cutoff was used for significance.

Parent autonomy support and control were significant predictors in their respective regressions, indicating that parents in condition A who improved in autonomy support were likely to have lower autonomy support and higher control at baseline. These findings suggest that parents who were already parenting very well were more likely to decrease their autonomy support in reaction to the condition A instructions, while parents who were a bit controlling or not completely autonomy supportive were more likely to show positive change. No other variables were significant predictors in any of the regressions.

I further explored the finding that parents in condition A were affected differently by the instructions based on their baseline autonomy support score with a repeated measures ANOVA (see Figure 3.3). I performed a median split of baseline autonomy support scores for those in condition A. The ANOVA showed that the effect of time was not significant ($F(1, 62) = .921$, $p > .05$), but the effect of baseline autonomy support group ($F(1, 62) = 16.16$, $p < .001$) and the interaction between baseline autonomy support group and time ($F(1, 62) = 26.21$, $p < .001$) were significant. Post-hoc *t*-tests found that parents who were low on baseline autonomy support significantly improved ($t(30) = -3.03$, $p < .01$), while parents who were high on baseline autonomy support significantly decreased ($t(32) = 4.20$, $p < .01$).

Table 3.11. *Condition A: Predicting Group Membership in Negative/0 vs. Positive Autonomy Support Change Scores*

			Autonomy Support Regression	Control Regression	Laissez Faire Regression
Model Chi Square			40.55*	37.86*	24.85*
	M Neg/0 Change Group	*M* Pos Change Group	Odds Ratio	Odds Ratio	Odds Ratio
SB Vocab	15.94	17.13	1.21	1.37	1.25
Child Gender	1.33	1.67	5.05	4.15	5.13[a]
Parent Education	6.16	5.77	1.10	.825	.772
Parent Involve	42.64	39.03	.890	.907	.867[a]
Parent Gender	1.61	1.42	.384	.364	.539
Base Child MEFS	30.03	34.13	1.04	1.03	1.02
Base Self Reg	4.25	3.99	.322	.151	.204
Base AS	4.51	3.80	.030*	--	--
Base Control	1.32	1.99	--	14.04*	--
Base Laissez Faire	1.21	1.26	--	--	1.59

[a] $p < .05$, * $p < .01$
Note: AS = Autonomy Support

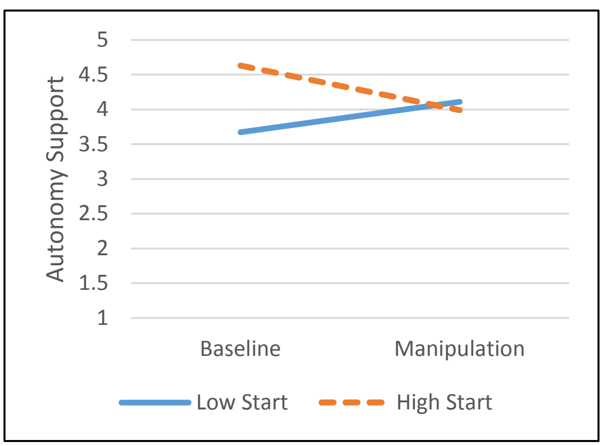

Figure 3.3. ANOVA examining effects of time and median split autonomy support on autonomy support.

Summary of Hypothesis 2. The manipulation instructions caused changes in parenting behavior. Condition C parents changed as expected, becoming less autonomy supportive and more controlling. Condition A parents became less controlling, as expected, but overall became more laissez faire rather than more autonomy supportive. However, the condition A instructions did raise autonomy support for parents who were less autonomy supportive and more controlling at baseline. Mothers were marginally more likely than fathers to become more laissez faire in condition A.

Hypothesis 3: Change in Parenting Behaviors Will Be Related to Change in Child Behaviors. Because I was interested in how changes in parenting predicted change in child behavior, I created corrected change scores for the relevant variables to examine this question parsimoniously. These variables were corrected for baseline starting score, and so were calculated as (Manip – Base)/Base. I calculated such a variable for the three dimensions of parenting quality (autonomy support, control, and laissez faire) as well as two of the child outcomes (child self-regulation and MEFS). The third child outcome, child solo puzzle, was only measured at post-test. Table 3.12 shows the correlations between changes in parenting and child outcome variables, before and after covarying condition assignment. Autonomy support change, control change, laissez faire change, and condition were all significantly intercorrelated. MEFS change was not correlated with the other child outcomes, but self-regulation change was correlated with child solo puzzle (even after covarying condition).

Table 3.12. *Correlations between Parenting Change Scores and Child Outcomes. Bottom Left: Bivariate. Top Right: Controlling for Condition*

	1	2	3	4	5	6	7
1. Autonomy Support Change	--	-.562**	-.472**	.275**	-.018	-.046	--
2. Control Change	-.695**	--	-.109	.049	.005	.150	--
3. Laissez Faire Change	-.234**	-.290**	--	-.289**	-.035	.113	--
4. Self-Regulation Change	.073	.246**	-.358**	--	-.022	.200*	--
5. MEFS Change	.033	-.063	-.002	-.052	--	-.099	--
6. Child Solo Puzzle	-.115	.212*	.058	.235*	-.113	--	--
7. Condition	-.495**	.683**	-.314**	.311**	-.098	.152	--

[a]*p* < .10, **p* < .05, ** *p* < .01
Note: MEFS = Minnesota Executive Function Scale.

I next examined how children were affected by condition assignment using *t*-tests (see Table 3.13). Children's self-regulation change scores differed by condition, however, children in group A showed larger decreases in self-regulation, contrary to expectations. Condition assignment did not affect child MEFS change scores or performance on the solo puzzle.

Because the manipulation did not change parenting exactly as expected, I examined the individual parenting quality dimensions to understand why children in condition A had lower self-regulation than children in condition C (see Figure 3.4).

Table 3.13. *Condition Differences in Child Outcomes*

	N		*Mean*		*SD*			
	Condit. A	Condit. C	Condit. A	Condit. C	Condit. A	Condit. C	*t*	Cohen's *d*
Self Reg Change	65	62	-.215	-.057	.244	.244	-3.66**	.648
Child MEFS Change	59	57	.352	.104	1.72	.474	1.05	.197
Child Solo Puzzle	60	58	-.121	.125	.787	.828	-.166	.305

[a]*p* < .10, **p* < .05, ** *p* < .01
Note: Self Reg = Self-Regulation. MEFS = Minnesota Executive Function Scale.

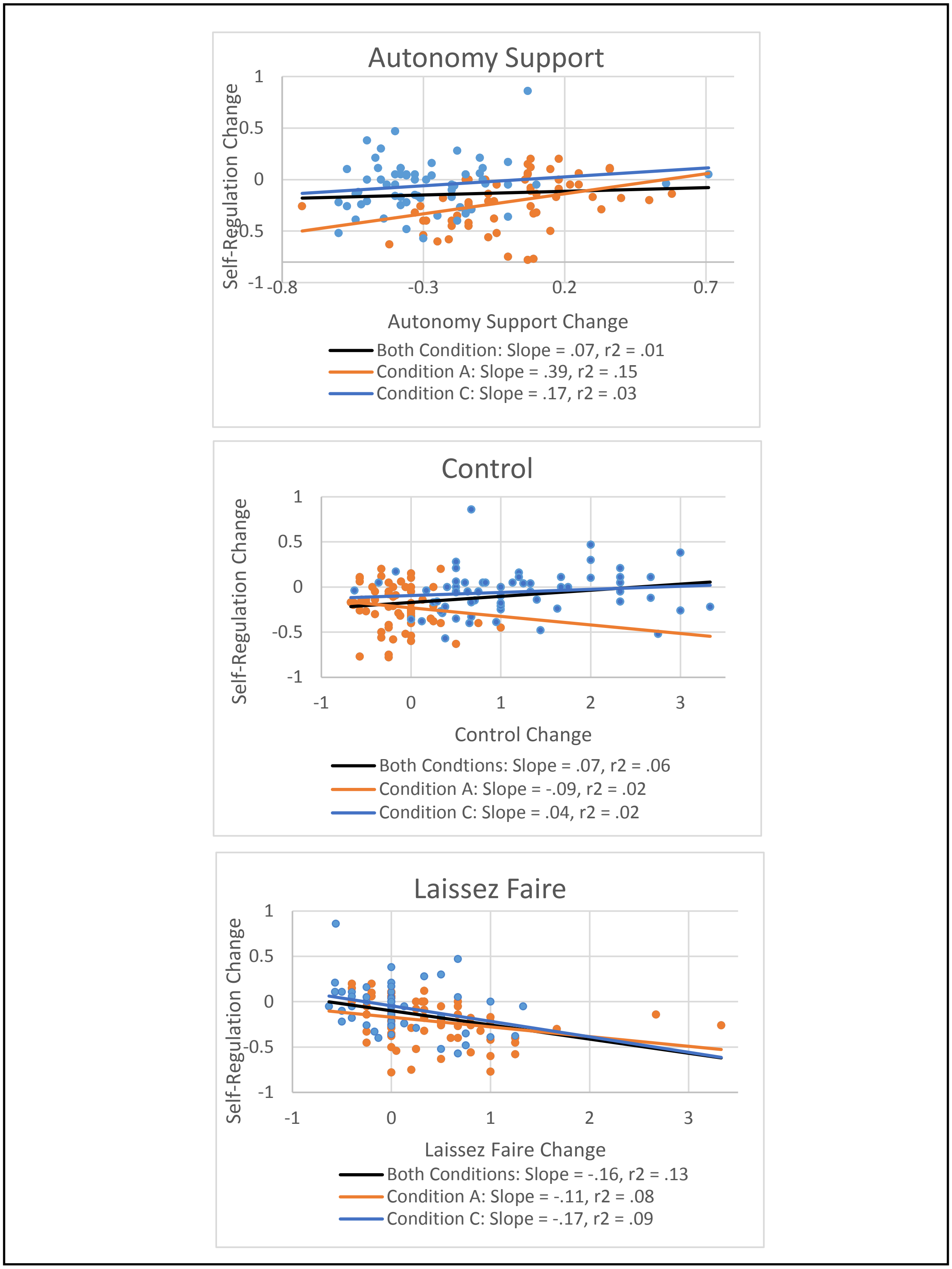

Figure 3.4. Scatterplots showing the relations between self-regulation change and the three dimensions of parenting quality.

Autonomy support change was not related to self-regulation change across conditions, but was significantly positively related when controlling for condition. This positive relation between autonomy support change and self-regulation change does not explain condition differences, as condition C had lower autonomy support change, but higher self-regulation change. For control change, there was a significant positive association with self-regulation across condition, but this finding did not hold when condition was covaried. In fact, there was a negative relation between control change and self-regulation change in condition A. Therefore, condition C parents being higher in control also does not explain why children in that condition had higher self-regulation than children in condition A. In contrast, laissez faire change was negatively associated with self-regulation change, both before and after controlling for condition, and had similar relations in both conditions. Therefore, the most plausible reason for the difference in child self-regulation change between conditions is the fact that condition A parents became more laissez faire than condition C parents, which was detrimental to their child's self-regulation.

The next step was to further investigate predictors of self-regulation change in a regression analysis. Because the manipulation changed multiple dimensions of parenting, I used all three in the following regressions to investigate the effect of parenting overall. Although control change was moderately related to autonomy support change and condition, it was not collinear using a .70 cutoff (Tabachnick & Fidell, 2001). Model 3 shows that parenting quality change had an effect on child self-regulation change. Autonomy support change and condition were the only significant predictors in the regression (Table 3.14).

Table 3.14. *Regression Predicting Child Self-Regulation Change*

	Beta	R^2	ΔR^2	F Change	p
Model 1		3.0%		.885	.476
Stanford Binet Vocab	.021				
Child Gender	.140				
Parent Education	.034				
Parent Involve	-.128				
Model 2		5.2%	2.3%	2.72	.102
Stanford Binet Vocab	-.017				
Child Gender	.129				
Parent Education	.031				
Parent Involve	-.131				
Base MEFS	.156				
Model 3		26.9%	20.8%	7.71	.000**
Stanford Binet Vocab	.011				
Child Gender	.108				
Parent Education	.085				
Stanford Binet Vocab	-.013				
Base MEFS	.130				
Condition	.251*				
Autonomy Support Change	.376*				
Control Change	.306[a]				
Laissez Faire Change	-.124				

[a]$p < .10$, *$p < .05$, ** $p < .01$

Note: MEFS = Minnesota Executive Function Scale.

There were no associations between parenting change and MEFS change scores, so this was not investigated further. I next investigated influences on child solo puzzle success. I was interested in contributions of both baseline and manipulation parenting, and therefore entered those variables in separate blocks rather than using change scores (Table 3.15). Parenting at neither baseline nor manipulation predicted child solo puzzle performance. Baseline MEFS was marginally significant in the first two models, and manipulation self-regulation was significant in all models tested.

Table 3.15. *Regression Predicting Child Solo Puzzle*

	Beta	R^2	ΔR^2	*F* Change	*p*
Model 1: Covariates and Child Behavior		15.4 %		2.75	.011*
SB Vocab	-.044				
Child Gender	.001				
Parent Ed	-.013				
Parent Involve	-.099				
Base MEFS	.183[a]				
Base Self Reg	.061				
Manip Self Reg	.281**				
Model 2: Baseline Parenting		17.2%	1.8%	.766	.516
SB Vocab	-.050				
Child Gender	.024				
Parent Ed	-.038				
Parent Involve	-.114				
Base MEFS	.174[a]				
Base Self Reg	.062				
Manip Self Reg	.276**				
Base AS	-.120				
Base Cont	-.236				
Base LF	-.026				
Model 3: Manip Parenting		20.8%	3.6%	1.11	.355
SB Vocab	-.054				
Child Gender	.015				
Parent Ed	-.023				
Parent Involve	-.130				
Base MEFS	.137				
Base Self Reg	.040				
Manip Self Reg	.327**				
Base AS	-.120				
Base Cont	-.241				
Base LF	-.028				
Manip AS	.195				
Manip Cont	.202				
Manip LF	.315				
Condition	.105				

[a]$p < .10$, *$p < .05$, ** $p < .01$

Exploratory analyses. I was again specifically interested in what I could learn from this study about interventions that would improve outcomes. I therefore examined differences in outcomes for children in condition A whose parents increased in autonomy support vs. those who decreased (see *t*-tests presented in Table 3.16; significance levels again adjusted to $p < .01$). Importantly, children of parents whose autonomy support benefited from the condition A instructions had more positive self-regulation change scores than children whose parents decreased in autonomy support. There were no differences in MEFS change scores or on the child solo puzzle.

Table 3.16. *Condition A: Differences in Child Outcomes for Parents Who Had Negative/0 vs. Positive Change in Autonomy Support*

	N		*Mean*		*SD*			
	Neg/0 Change	Pos Change	Neg/0 Change	Pos Change	Neg/0 Change	Pos Change	*t*	Cohen's *d*
Self Reg Change	33	31	-.319	-.120	.198	.246	-3.75*	.891
MEFS Change	29	29	.622	.095	2.42	.313	1.16	.305
Child Solo Puzzle	31	28	-.267	-.009	.720	.818	-1.29	.218

[a]$p < .05$, *$p < .01$
Self Reg = Self-Regulation.

Summary of Hypothesis 3. Self-regulation change scores were predicted by condition assignment (with condition A being more negatively affected). Laissez faire parenting predicted poorer self-regulation before and after covarying condition, while autonomy support positively predicted self-regulation change in a regression analysis above and beyond covariates and the other parenting dimensions. Parents in condition A who improved in autonomy support had children with more positive self-regulation change scores than those who decreased in autonomy support. Change in MEFS was not associated with any parenting variables. Child solo puzzle performance was predicted by baseline MEFS (marginally) and manipulation self-regulation, but not by parent behavior.

Chapter 4. Discussion

The current study sought a greater understanding of the parenting precursors of strong self-regulation and executive function skills. This was done through an experimental investigation of the short-term effects of autonomy supportive parenting from mothers and fathers.

Comparing Mother and Father Parenting

This study was one of the first to observe autonomy supportive parenting quality from both mothers and fathers. Similar to the one previous study that had done so (Connor et al., 1997), I found no significant differences in baseline parenting quality between mothers and fathers. Effects of parenting on child baseline self-regulation did not differ by parent gender. As is commonly found, mothers did report more involvement with their child than fathers (e.g., Cabrera et al., 2000; Meuwissen & Carlson, 2015). There was a marginal interaction between parent gender and autonomy support on baseline MEFS, with mothers trending toward having a stronger effect, even after covarying level of involvement. This could be evidence for Kiel and Kalomiris's (2015) suggestion that mother parenting has unique effects on children while father parenting is absorbed into general family climate, however, because the interaction was only marginal and even mothers did not account for much variance in MEFS performance, this would need to be replicated in a larger sample.

There were some significant differences in how mothers and fathers reacted to the instructions given in the manipulation phase. When measured by counts of verbal and physical behaviors, mothers more closely followed the instructions they were given. However, this seems to be mainly due to mothers showing larger increases in laissez faire when assigned to condition A than fathers (there were no such differences in condition C). It appears mothers were more susceptible to the iatrogenic effect of not providing enough help to their child. Previous studies have found larger effects of interventions on mothers than fathers, but have typically attributed this finding to lower levels of father participation and homework completion (Magill-Evans et al., 2006; Tucker et al., 1998). In this study, mothers and fathers received the same dose of instruction, as they all received the written and verbal instructions and the demonstration video. However, mothers and fathers were shown different demonstration videos, as the actors were matched to parent gender. One possibility is that mothers are more able or willing to change their parenting behaviors than fathers. However, in this study there is an alternative possibility that the mother video for condition A prompted more laissez faire behavior than the father video. To clarify this finding that mothers are more affected by interventions, future studies should examine differences in mothers' and fathers' self-awareness of their parenting and attitudes toward suggested changes.

Relations between Parenting and Child Behavior at Baseline

I expected the baseline portion of this study to replicate previous findings that parenting quality is related to child EF behavior. Child self-regulation during the puzzle was indeed related to parent autonomy support and laissez faire (inversely), over and above covariates. Child vocabulary was also related to self-regulation. Child vocabulary and parent autonomy support are frequently found to be related to self-regulation at this age (Hammond et al., 2012; Landry et al., 2002; Matte-Gagne & Bernier, 2011; Meuwissen & Carlson, 2015), however laissez faire has not been examined as a separate predictor in these studies. Interestingly, in this study laissez faire was negatively related to self-regulation even when covarying autonomy support, suggesting that it may be a uniquely important aspect of parenting in this situation. Because parent and child behavior were measured while the dyad was interacting during a single task, we have no information about the direction of causality for these links. Parents who are high in autonomy support and low in laissez faire may be providing an environment that is supportive to child self-regulation, while at the same time children who are highly self-regulated may provide more opportunities for parents to show high autonomy support and low laissez faire behaviors.

We also examined child MEFS scores in relation to baseline parenting, which is an outcome independent of the dyadic task setting. Contrary to expectations based on previous findings from the same lab with samples drawn from the same population, no dimensions of parenting were related to child MEFS. There are multiple possible explanations for this null finding. First, many previous studies have used a battery of EF tasks, so using the MEFS alone may have allowed for too much error in the measurement of child EF. Second, the instructions given before the baseline puzzle were slightly different from previous studies. In this study, we asked parents to work with their child "just like you would at home," whereas in previous studies we indicated to the parent that we would like to see what the child can do on his/her own, but they could help as needed. It is possible the current instructions led to lower variation in parent behavior. Third, it is possible that mother behavior was related to child MEFS, but the study was a bit underpowered to detect significant interactions with the sample size used.

Finally, there may have been some issues with the measurement of parenting quality, as having coders rate both baseline and manipulation parenting for this study could have changed how the baseline parenting was rated. In studies where only a parent's normal parenting is measured, coders typically adapt the 5-point scale to capture variation in the parenting they see. Therefore, the meaning of each number may vary across study populations so that each study uses all numbers 1-5 (e.g., homeless (Distefano & Masten, 2016) vs. lab (Meuwissen & Carlson, 2015) samples). However, this adapting of scales to a sample means the scores are rather subjective, and exact numbers cannot typically be compared across studies. In the current study, this is a more significant problem because the same raters coded parenting behavior in two different contexts: baseline and manipulation. It was necessary to use the same coders at both time points so that change could be directly measured. However, because lab parents typically have fairly high quality parenting and the instructions made many parents worse (by design in the case of condition C), coders saw more extreme examples of highly controlling or highly laissez faire behavior in the manipulation phase, and therefore less variation was coded in the baseline phase than in other similar studies. For example, in the Meuwissen and Carlson (2015) study with fathers and 3-year-olds, there was a lower mean score of autonomy support (3.59 vs. 4.13 in the current study), a wider range (1.33 – 5 vs. 2.33 – 5 in the current study) and a larger standard deviation (.93 vs. .68 in the current study). This constrained variation could have contributed to the non-replication of expected results even while using the same coding scheme and similar low-risk lab samples as previous studies (e.g., Bernier et al., 2010; Meuwissen & Carlson, 2015). It is possible that developing a scale with more scale points (e.g., 10 rather than 5) could allow researchers to stick more closely to objective measures while still capturing variation within their sample.

Changes in Parenting Due to Manipulation Instructions

One main finding of this study was that parents changed their behavior in response to brief instructions given in a mix of verbal, written, and observed video modes. Parents in the two conditions did not differ on any parenting variables at baseline, but differed on all parenting variables during the manipulation phase in the expected direction. This shows that parents understood what was being asked and were able to immediately implement the suggested behaviors in a 10-minute interaction with their child.

Our condition C instructions resulted in expected changes in parenting behavior, with parents becoming more controlling and less autonomy supportive. However, in condition A, the instructions reduced controlling behaviors, but were not successful in increasing positive autonomy support behaviors. Instead, parents in condition A generally became more laissez faire, and did not provide enough help. Previous studies had found that parents are often too controlling (e.g., Merz et al., 2015; Meuwissen & Carlson, 2015; in prep), and therefore the instructions for condition A focused on letting children make their own decisions and reducing direct instructions from parents, which did seem to affect parent behavior. The instructions also suggested positive behaviors such as asking questions and giving useful hints, but it appears parents were less likely to implement these. The instructions and demonstrations may not have had a clear enough focus on being responsive to the child, how to identify when the child really did need help, and the appropriate help to provide in those instances.

Although, as a group, condition A did not improve in autonomy support, about half of parents in that condition did have higher autonomy support scores at manipulation than baseline. Parents who were already scoring very well at autonomy support and control were more likely to decrease in autonomy support, while parents who had room to become more autonomy supportive and less controlling benefited from instructions encouraging those behaviors. It may be that parents participating in this study had an expectation that they needed to change their behavior for the manipulation phase, and therefore parents who were highly autonomy supportive at baseline became more laissez faire rather than continued their typical high autonomy support. Instructions to change parenting may be most beneficial when they target parenting behaviors the parent is not already doing well. Future studies should continue to investigate this finding to ensure these results were not due to regression to the mean. It is promising that high baseline control (in addition to low baseline autonomy support) predicted increases in autonomy support, providing some evidence that this is a meaningful finding not simply due to measurement variation.

Effects of Changes in Parenting on Child Outcomes

Three child outcomes were investigated in the manipulation and post-test phases. The first was change in child self-regulation between the two dyadic puzzles. The average self-regulation score in both conditions decreased from baseline to manipulation puzzle, which may have been due to multiple factors. The shape puzzle, which came second, might have been more difficult and less familiar compared to the jigsaw puzzle. Additionally, children could have been reacting to the fact that their parent was acting differently than normal, especially as parents in both conditions provided lower quality help at manipulation, with condition A being more laissez faire and condition C being more controlling.

In this study, when all dimensions of parenting quality were examined simultaneously, change in parenting significantly predicted change in child self-regulation. This shows that parenting has a direct effect on concurrent child self-regulation, and is an improvement over correlational studies which cannot distinguish between parents affecting children vs. children eliciting reactions from parents. This study provides important evidence that changes in parent behavior, as a result of random assignment not due to child characteristics, affect child behavior. It therefore contributes to establishing proof of concept that parenting interventions could promote child self-regulation.

The intent of this study was to manipulate parenting along a single dimension of autonomy support vs. control. However, because the laissez faire dimension also varied significantly, it became less straightforward to isolate the effect of each parenting dimension on child behavior, yet more necessary to look at the specific parenting dimensions rather than use condition assignment for a proxy of parenting quality. When looking at separate parenting dimensions, autonomy support and child self-regulation were generally related as expected. When condition was covaried, change in autonomy support and change in self-regulation were positively related, and this relation held above demographic covariates and the other parenting dimensions. In condition A, the subgroup of parents who increased their autonomy support in response to the instructions had children with more positive self-regulation change scores compared to the subgroup who decreased. However, because the randomly assigned instructions were not successful in increasing parent autonomy support in condition A as a whole, it is possible that parents in condition A who increased did so because their children showed a less drastic decrease in self-regulation, and it was therefore easier to provide high-quality parenting.

One unexpected finding was that, as a whole, children in condition A had greater decreases in self-regulation than children in condition C. Analyses showed that the most likely explanation for this is the increased laissez faire parenting in condition A. My hypothesis was that controlling parenting would be detrimental to children, which would lead to condition C children having lower self-regulation. However, it appears that at least in the short-term context of the dyadic puzzle task, laissez faire parenting has an even more detrimental effect on children than controlling behaviors. Previous research has not typically explored laissez faire behavior, and part of the reason may be that at baseline, parents typically show a low incidence of these behaviors.

Change in child MEFS scores was not related to condition assignment or any parenting change variables. MEFS scores at pre- and post-test were highly correlated (r = .798), so it is likely the brief interaction with the parent was not a strong enough intervention to affect MEFS scores. Changing the context of a situation (e.g., a parent acting differently during a brief interaction) may be more likely to affect hot aspects of EF such as motivation and persistence, which were measured by our self-regulation ratings, rather than the underlying cognitive abilities measured by the MEFS (Zelazo, Qu, & Kesek, 2010). Child solo puzzle performance was also not related to condition assignment or parenting at baseline or manipulation. However, it was related to baseline MEFS scores and to child self-regulation in the manipulation puzzle. This suggests that children with better executive function skills were able to stay self-regulated in the manipulation puzzle regardless of how their parent’s behavior had changed, and were therefore able to learn about the puzzle and be more successful when trying it on their own. Future studies that are able to more effectively change one dimension of parenting at a time should continue to investigate whether parenting effects can transfer to a post-test through the child's opportunities for learning in the dyadic puzzle.

Strengths of the Study

This study has a number of important strengths. First, it included an equal number of mothers and fathers, which is rare in parenting research. Findings supported the view that high quality parenting from both parents can positively impact child development. This suggests that studies including only mothers do not provide a complete picture of caregiving environments.

A second strength was the use of a randomly assigned experimental design. The vast majority of research on autonomy supportive parenting has relied on correlational and longitudinal data, which cannot provide conclusive information about direction of effects between parents and children. This study found that changes in parenting did affect child self-regulation, although it did not transfer to the MEFS or child solo puzzle.

Two new observational rating scales of self-regulation were created for this study that have the potential to be useful in other studies. Child self-regulation has most often been measured either by parent/teacher report or with lab tasks. Adults who report on child self-regulation may have a biased or incomplete perspective on the child, and may be subject to desirability bias. Lab tasks are useful for measuring basic neurocognitive skills, but are done in artificial circumstances that may not show high consistency with real-life behavior. Indeed, lab tasks and behavior ratings of EF are not typically strongly related and appear to measure substantially different constructs (e.g., Toplak, West, &

Stanovich, 2013). These new observational ratings of self-regulation provide a way to measure child behavior in a context that is more similar to home and school settings (e.g., doing a puzzle) but uses an objective rater. The first scale is designed to measure child self-regulation during a dyadic task, which is useful to quantify child contributions to parent-child interactions. Psychometric properties were strong, with a scale consistency alpha above .8 and inter-rater reliability above .9. This scale was more strongly related to other EF measures during the manipulation phase than the baseline phase. It is possible that the baseline phase did not tax children's regulatory abilities, and therefore they were able to rely on automatic behavior. In the manipulation phase, when children were dealing with a low-level stressor (change in parent's behavior), there may have been greater opportunity to discriminate between children in their use of use top-down regulatory processes.

I also designed the solo puzzle task and rating scale, which again had strong psychometric properties, with both a scale consistency alpha and inter-rater reliability above .9. For this scale, the child is rated on a comprehensive measure of self-regulation skills, including persistence, planning, and self-monitoring, known to be crucial for adaptive behavior. The task was correlated with the MEFS, indicating that it may be a good measure of how EF skills are applied in a more real-life context. This rating scale of child solo behavior has the potential to be used in many future studies looking for an externally valid but unbiased way to measure child self-regulation.

Limitations of the Study

A number of limitations were present in this study. One aim was to directly compare mothers and fathers by recruiting equal numbers of each. However, fathers had a lower acceptance rate for the study than mothers. Therefore, it is possible that there are unique characteristics of fathers who agreed to participate in this study that do not generalize to the wider population of fathers. This study found no differences between mothers and fathers who came in for the study, but it is possible that participating fathers were more involved, felt more competent in their parenting role, or came from families with different dynamics than fathers who did not accept the study invitation. Future studies should attempt to recruit more comparable samples of mothers and fathers.

The parenting quality rating scales used had some limitations. The laissez faire scale was coded but never used for analyses by the creators of the scales. The autonomy support and control scales have clear guidelines for ratings of 1, 3, and 5. However, the laissez faire scale was defined by one extreme statement describing a score of 5 (e.g., "Mother does not emit any verbalizations related to the task and she uses a monotone tone of voice throughout the task") without details about how to delineate scores of 1-4. This made the laissez faire scale more difficult to train raters on, and is the most likely reason why the laissez faire composite had the lowest alpha measuring composite consistency as well as the lowest inter-rater reliability. The laissez faire scale was a crucial part of examining the effect of the instructions on parenting behavior in this study. However, the low quality psychometrics of this scale suggest some of these findings may need to be interpreted with caution.

Additionally, all of the parenting scales were quite skewed toward positive scores at baseline. The verbalization subscales were especially problematic, with a high percentage of parents scoring the best possible score (AS (a 5): 56%, Control (a 1): 79%, LF (a 1): 77%). Therefore, variation in the composite scores may have been masked by the lack of variation in the verbalization subscale. It may be that these scales do not provide enough detail to measure meaningful differences in a very high-functioning sample. Additionally, as outlined above, the wider variation in parenting at manipulation may have contributed to the lack of variation coded at baseline.

This study was also limited by the modest sample size. The study was adequately powered to detect medium effect sizes when comparing 2 groups, such as conditions or parent gender. However, it was underpowered to detect small effect sizes, or to examine differences between smaller subgroups (e.g., mother-daughter, mother-son, father-daughter, father-son dyads). Therefore, it is possible some of the relations between variables in this study could not be detected. Another limitation of the sample was the lack of diversity in parent education and racial/ethnic backgrounds. The results of this study may not generalize beyond white upper-middle-class families.

Finally, a future direction this study did not address was how effects might operate across longer periods of time. This study found that parents can change their behavior in response to a brief intervention for an immediate 10-minute period, but it is not known what dosage of treatment would be needed to sustain these changes through multiple interactions with their child across subsequent weeks or months. Additionally, it is possible that changes in parenting may affect children differently in the short vs. long-term. When a parent becomes more controlling, in the short term the child may show more self-regulation because their abilities are not being taxed, but this lack of opportunity for practice could limit future growth. Conversely, children in this study tended to show frustration and poor self-regulation when a parent became more laissez faire. This may have simply been a reaction to parenting behavior the child is not used to.

This study cannot conclude whether laissez faire parenting is detrimental only in the short term until the child becomes accustomed to taking more responsibility in the task, or if this lack of support would hinder what children are able to learn and accomplish themselves on a longer time scale.

Recommendations for Future Intervention Work

We can learn a number of useful things about parent autonomy support interventions from the current study that may help to inform better interventions in the future.

1. Give parents immediate practice with the skills. Few studies have specifically trained autonomy support in parents. The findings of this study indicate parents are able to understand the concept of autonomy support (when briefly presented through written and verbal instructions and a demonstration video) enough to change their behavior around that dimension of parenting. We saw substantial change in parenting in an immediately following 10-minute interaction, and giving parents this sort of immediate practice with their own child may be a useful way for full-scale interventions to help parents retain the information they are learning. This type of hands-on practice may be especially crucial for fathers (Magill-Evans et al., 2006).

2. Interventions may be most effective when the messages are tailored to the parents' needs. The condition A instructions were only helpful for parents who were not already high in autonomy support and low in control at baseline. This indicates that parenting interventions may not work best with a one-size-fits-all approach, but may be more effective when targeted specifically to areas of needed improvement. In some cases, it is not possible to have prior knowledge about a parent's typical behavior or to individually tailor messages. Communications would then need to be carefully crafted so they recommend change when appropriate but do not pressure parents to whom the message does not apply to change simply for the sake of following instructions. It may be useful to provide parents with a self-reflective tool so they have a sense of what they are already doing well and what areas they should work to improve, rather than to assume all parents will need to change in similar ways.

3. Present autonomy support as an ideal mid-point. Although this study was successful in reducing controlling behaviors in condition A, they seemed to be replaced mainly by laissez faire parenting rather than high autonomy support. Future interventions that attempt to decrease controlling behaviors need to be very intentional in teaching parents how to replace them with positive autonomy support behaviors rather than refrain from helping their child at all. It may be more useful to present the concept of autonomy support as a midpoint on a scale between helping too much and too little. If parents were aware they were aiming for a “Goldilocks just-right” type of behavior, they may be less likely to change their behavior so that it is no longer autonomy supportive.

Conclusions

This study shows that parent autonomy support interventions are a promising pathway on the goal to support child self-regulation skills. The first major finding was that a brief intervention was able to change parent behavior. Importantly, parents who had lower-quality parenting at baseline were more likely to benefit from the instructions given in the high-autonomy support condition. The second major finding was that changing parenting caused a change in child self-regulation during the puzzle, with increases in laissez faire parenting being especially detrimental to child self-regulation.

This is an important new finding, as it shows that lower quality parenting causes lower child self-regulation during that task. Additionally, parents in condition A who increased their autonomy support as a result of the manipulation then had children who showed higher self-regulation in the manipulation puzzle than parents who did not benefit. Finally, this study supported the hypothesis that autonomy support from both mothers and fathers is relevant to child self-regulation, which indicates interventions could be most effective if they address a child's multiple caregivers. Autonomy support appears to be a key parenting skill for setting children up for a lifetime of success.

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Appendix A.

Coding Scheme for Child Self-Regulation during Dyadic Puzzles

Developed by Alyssa Meuwissen, 2016.

C = child, P = parent

1. Child's use of help given.

   Is the child willing to cooperate with D? Does C resist P or act in contrary? Does C perseverate on own ideas?

   - Low (1): C is stubborn, resistant, or ignores the help they are given. C perseverates on own idea even when P tries to correct.
   - Med (3): C is generally cooperative, but doesn't follow all directions quickly, may perseverate for brief time on own ideas.
   - High (5): C appropriately uses the help they are offered, cooperates well with D. C is able to hold in mind what they are hearing and carry it out. C easily moves on to better strategies when prompted by D.

2. Goal-directed behavior

   Does the child make random attempts or is there some logic or order to their thinking? Does the child show any ability to evaluate the progress or next steps of the puzzle, or to identify mistakes? **IF** given strategies by parent, is the child able to generalize a statement to multiple steps of the puzzle?

   - Low (1): C works on puzzle in random fashion. Child's behavior does not seem to be directed toward a goal, child is not able to identify any sub-goals. Connecting pieces randomly would fit this.
   - Med (3): C seems to mostly direct behavior toward the goal of the task. C may use some strategies after being told for a brief time. C may show low levels of evaluation of progress.
   - High (5): C comes up with ways to organize the task and uses strategies to direct behavior toward the end goal. If given, C is able to take a hint and apply it to the rest of the puzzle.

3. Distractibility

   Is C able to stay focused on the task using their own willpower?

   - Low (1): C is not attending to the puzzle for most of the task. C spends a significant portion of time talking about other things/wandering away from the table. Even after prompts from D, does not stay focused on task.
   - Med (3): C is mostly focused on task, but has a few momentary lapses that need to be redirected by D. C may be distracted by external stimuli but quickly returns on own.
   - High (5): C shows no desire to deviate from task, stays focused the whole time.

4. Persistence vs. Frustration

   Does C get easily frustrated with the task? Do they give up on trying something very quickly? Do they show negative emotions or whine? Do they seem to be working hard?

   - Low (1): C is very easily frustrated by the task. When doesn't get right answer immediately, gives up or becomes emotionally dysregulated.
   - Med (3): C is able to work on task fairly continually, but may not show great persistence or show low levels of negative emotion.
   - High (5): C consistently tries multiple ways before giving up, they are able to take correction without getting upset, they show motivation to contribute to the completion of the task.

5. Child Self-Efficacy

   Does the child see him/herself as the main actor of the task? Do they take on responsibility? Is C willing to try some things on their own? Does C show initiative in what to do next? Or do they ask P for a lot of help? Do they only make moves when directed? Does C have confidence and self-efficacy for task?

   - Low (1): C shows little independent action in the task. They wait to be directed or ask for a lot of help. They do not seem to want to be the main actor.
   - Med (3): C shows mix of relying on P and making some contributions to the task.
   - High (5): C takes responsibility in task, uses D's hints when appropriate but also adds own ideas of what to do next. C sees him/herself as the main actor and takes ownership of the task.

Appendix B.

Parent Adherence Coding Scheme

Developed by Alyssa Meuwissen, 2016

1. Puzzles Finished: each time the dyad completes a picture. Pictures that they give up on without completing are not counted.

2. Parent touches block without placing

Includes: adjusting pieces on puzzle (1 touch), handing child specific piece or putting a groups of the right colors in front of C (1 touch).

Does not include: taking handfuls of blocks out of the bucket, shoving pieces around table to create more room, helping clear off finished puzzle

3. Parent places a block:

Includes: parent putting a correct block on the puzzle, parent moving an incorrect placement by C to correct placement (including turning to the correct orientation). If parent turns a block at least 90 degrees, it counts as placing (not adjusting).

4. Parent asks open-ended question about puzzle:

Includes: questions that require a thought and an answer from child, questions that give the child a choice, questions that prompt C to re-think an error.

-What is the hat made of?

-What goes in the middle of the red ones?

-What do we need next?

-Does that look like this side?

Does not include: direct instructions in question form, repeating what the child said.

-Can you put your two trapezoids here?

5. Parent gives direct instruction about what to place next:

Includes: statements and questions that directly tell the child what they should do next (specify an action for the child).

-Put a triangle right in the middle

-I think the blue diamond goes on the other side.

-Very carefully line them up with the outline.

Count as 1 statement if two sentences are asking for same action (We need to put a blue piece next to it. Can you find a blue piece?) or if repeat the exact same direction in a row.

Count as 2 statements if repeats the same direction but does something else in the middle of it (other talking or adjusting pieces).

**Statements describing the picture (I see hexagons and diamonds) or asking the child if they see thing (Do you see the square on here?) are not coded anywhere. General explanation statements (we have to put these blocks on the mat to make it look like this picture) are not coded. Repeating/agreeing with C is not coded (C: We need some green pieces. P: We do need some green pieces.)

Appendix C.

Child Solo Puzzle Coding Scheme

Developed by Alyssa Meuwissen, 2016

E = Experimenter, C = child

ID:

Start time (when E leaves table):

Time of last working (when C puts on or takes off a block from puzzle):

Total time working (Time of last working – start time. **If C competes both puzzles, this is always 600 seconds):

Actual end time (Time E stops the puzzle):

Is the parent in the room? [Y/N]

Does the child interact with the parent (verbal or nonverbally)? [Y/N]

Does C put pieces onto the mat? [Y/N]:

Does C look at picture to see what is needed? [0/1/2]:

> 0 = no, 1 = may seem to look at it once or twice, but doesn't use it to correct mistakes all the time. 2 = seems to match building to picture shown.

Does C "finish" completing pictures? [0/1/2]:

> *Finished if C believes they have completed making the picture.

How many pieces are correctly placed at the end?

> Puzzle 1: Puzzle 2: Total:
>
> Cake: 4 orange and 1 blue per candle, 4 candles = 20. 10 red for cake. Total: 30 possible
>
> Duck: 10 blue, 3 yellow, 2 green. Total: 15 possible

Why does C end? Frustrated/Bored/Finished/Other

> Explain:

**Give all 1s if child works for less than 2 min.

1. Goal-directed behavior:

   Does the child make random attempts or is there some logic or order to their thinking? Does the child show any ability to work on the puzzle step by step? Does the child show any ability to evaluate progress or correct mistakes?

- Low: C works on puzzle in random fashion. Child's behavior does not seem to be directed toward a goal, child is not able to identify any sub-goals. Connecting pieces randomly would fit this.
- Med: C seems to mostly direct behavior toward the goal of the task. C may work on one sub-goal at a time. C may show low levels of evaluation of progress/identification of mistakes (e.g., realizes they are wrong but can't correct).
- High: C comes up with ways to organize the task and uses strategies to direct behavior toward the end goal. C either does not make mistakes or is able to correct the majority of mistakes made.

2. Distractibility:

   Is C able to stay focused on the task using their own willpower?

   - Low: C is not attending to the puzzle for most of the task. C spends a significant portion of time talking about other things/wandering away from the table.
   - Med: C is mostly focused on task, but has a few momentary lapses. C may be distracted by external stimuli but quickly returns on own.
   - High: C shows no desire to deviate from task, stays focused the whole time.

3. Persistence vs. Frustration:

   Does C get easily frustrated with the task? Do they give up on trying something very quickly? Do they show negative emotions or whine? Do they seem to be working hard?

   - Low: C is very easily frustrated by the task. When doesn't get right answer immediately, gives up or becomes emotionally dysregulated.
   - Med: C is able to work on task fairly continually, but may not show great persistence or show low levels of negative emotion.
   - High: C consistently tries multiple ways before giving up, they show motivation to complete the task.